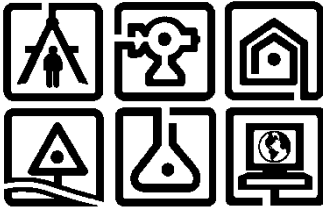


April 20, 2023
(Revised September 11, 2023)



NYS Brownfield Cleanup Program

Remedial Action Work Plan

5 Scobie Drive
City of Newburgh
Orange County, New York
BCP No. C336085

Prepared for:

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**CERTIFICATION
5 SCOBIE DRIVE, NEWBURGH, NEW YORK
REMEDIAL ACTION WORK PLAN**

I, Rosaura Andújar-McNeil, P.E., certify that I am a NYS registered professional engineer and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) dated May 3, 2010.

097844

NYS Professional Engineer #

Date

Signature

**BROWNFIELDS CLEANUP PROJECT
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Exhibit 3:	Jurisdictional Determination from USACOE

1.0 INTRODUCTION & PURPOSE

1.1 Introduction

On behalf of Scobie Industrial Partners, LLC, C.T. Male Associates Engineering, Surveying, Architecture & Landscape Architecture, P.C. (C.T. Male) has prepared this Remedial Action Work Plan (RAWP) pursuant to the New York State Department of Environmental Conservation (NYSDEC or Department) Brownfield Cleanup Program (BCP) for the property known as 5 Scobie Drive in the City of Newburgh, Orange County, New York (herein “the Site”). A Site Location Map is presented as Figure 1.

The City of Newburgh Industrial Development Agency (IDA, the Volunteer) entered into a Brownfield Cleanup Agreement (BCA) with the NYSDEC in July 2013 (BCA Index No.: C336085-05-13) for an approximate 18.3-acre property (the Site). The Site is currently a BCP site (BCP No. C336085). The BCA was amended in March 2023 to reduce the BCP Site to 15.24 acres and add the future Site owners/developers, Scobie Industrial Partners, LLC (SIP) as an additional Volunteer.

The proposed remedy for the Site will pursue 6 NYCRR Part 375 Track 4 Soil Cleanup Objectives (SCOs). Track 4 SCOs consists of restricted use with site-specific SCOs. Site-specific SCOs are anticipated to be SCOs for Restricted Commercial Use. The main elements of the proposed remedy consist of limited soil investigation/characterization in central portion of the Site (at/near TP-17), limited excavation of hazardous waste (if encountered) or soils not suitable for construction purposes (if encountered), placement of a surface cover, installation of a sub-slab depressurization system in on-Site buildings, continued monitoring (e.g. groundwater) and the implementation of institutional controls (Site and groundwater use restrictions).

1.2 Purpose and Goal

The purpose of the RAWP is to provide a conceptual plan for the selected Site remedy. Preliminary Site plans are currently in progress. A draft Conceptual Site Plan is included as Exhibit 1. Detailed remedial plans will be developed once the City of Newburgh (City) Planning Board has approved the Site Plans for this proposed development. The future

Site development plans will include grading and stormwater management plans that will incorporate the Site remedy as approved by the NYSDEC.

The goal of this RAWP is to provide environmental guidance to SIP's design and construction team for the preparation of technical specifications, bidding, and construction documents to support the proposed Site development. This guidance is intended to incorporate remedial action requirements as approved by the NYSDEC into the overall project construction documents. Due to the general guidance provided in this RAWP, a Remedial Design Document will be prepared subsequent to RAWP approval and Site Plan preparation to provide further details on remedial design elements not fully defined at this time.

SIP shall comply with the requirements identified in the approved RAWP and future Remedial Design Document during any and all construction activities performed at the Site.

2.0 NATURE AND EXTENT OF CONTAMINATION

2.1 Previous Investigations Prior to the Remedial Investigation

Contaminants have been documented at the Site during several previous investigations prior to the RI Report. Historic use of the Site and the findings of investigations performed on adjacent properties indicated the potential for impacts to on-Site soil and groundwater. A brief chronological summary of the on- and off-Site investigations prior to the RI is provided below:

- 1984 Deep Test Pit Investigation, performed by McGoey Hauser and Edsall (MHE); ten (10) test pits were excavated at various locations across the Site for the City of Newburgh IDA around the time of purchase. Petroleum odors and waste material were observed at multiple locations. A test pit location map could not be located.
- 1988, Final Draft Inspection Report, Newburgh Landfill, prepared by NUS Corporation. The inspection identified a 30-acre site, which suggests that it also included the City's DPW property. Samples were obtained during the inspection, and heavy metals, polychlorinated biphenyls (PCBs) and petroleum compounds were detected.
- 2002, Report for the Characterization of Drums, City of Newburgh DPW Landfill, prepared by First Environment. This investigation identified 430 containers on the City-owned property and 26 containers on the 5 Scobie Drive Site. Testing of the drum contents indicated the presence of hazardous waste on the City-owned property.
- 2004, Supplemental Remedial Investigation Report, DuPont-Stauffer Landfill, prepared by the Corporate Remediation Group. Soil and groundwater samples obtained during this investigation contained solvents, heavy metals, PCBs and polycyclic aromatic hydrocarbons (PAHs).
- 2004, Phase I Environmental Site Assessment (ESA), Vacant Parcel, 7-13 Scobie Drive (now 5 Scobie Drive), Newburgh, New York, prepared by HRP Associates. The Phase I ESA recommended additional investigation to confirm the absence or presence of hazardous waste based on the results of previous investigations on adjacent properties.

- 2008, Drum Characterization Report, Newburgh DPW Landfill, prepared by Camp Dresser and McKee (CDM). Soil borings installed on the City IDA property detected heavy metals contamination.
- 2011, Drum Cache Area Operating Plan, prepared by O'Brien and Gere for DuPont-Stauffer. The plan described the process for removing drums and hazardous waste from the DPW site, which was completed in 2012. Hazardous waste was identified on the DPW property, and PAH and metals contamination were identified on the 5 Scobie Drive property.
- April 2013, Drum Cache Area Removal Action, The City of Newburgh/Newburgh City Landfill Superfund Site (CERCLIS ID #NYD980534846) Newburgh, New York, Site Number 3-36-063, prepared by Obrien and Gere. A portion of this removal action occurred on the 5 Scobie Drive Site. No drums were encountered at the Site. PAHs and metal contamination was documented.

The available information indicates that the 5 Scobie Drive Site was formerly part of a solid waste landfill operated by the City until the 1960's, when the property was taken by the NYSDOT for an off ramp connecting Route 9W to I-84. NYSDOT conveyed the property to the City IDA in 1984 and a test pit investigation performed in 1984 detected a substantial volume of what is referred to as "garbage".

In 1988, NUS Corporation (NUS) conducted a Site Inspection of the City of Newburgh Landfill for the USEPA. The findings are documented in a report entitled "A Final Draft Inspection Report prepared for the USEPA by NUS Corporation, 1988" which describes the inspection of a 30-acre municipal landfill site in Newburgh New York. Available mapping in that report indicates that the landfill included the current Newburgh Department of Public Works (DPW) site and all or significant portions of 5 Scobie Drive property. The NUS report indicated that the Newburgh Landfill operated from the 1940s to 1976 and may have accepted sludge and other waste products from the adjacent DuPont and Stauffer Chemical companies. During NUS's site inspection, surface soil staining was observed on the northeast edge of the landfill. NUS identified drums on the City IDA parcel. Samples were also obtained during the site inspection and the results indicated hazardous substances and petroleum at elevated levels at multiple locations. Sampling was primarily confined to the DPW parcels.

In 2002, the City commissioned a drum characterization study at its DPW site. The report entitled "Report for Characterization of Drums, City of Newburgh DPW Landfill, Pierces

Road, Newburgh, New York”, prepared by First Environment indicated that approximately 26 drums containing unknown waste materials were located on the City IDA’s 5 Scobie Drive Property. Elevated photo-ionization detector (PID) readings were noted in some of the drums. In addition, a petroleum storage tank was observed on the City IDA property.

The DPW site was listed on the NYSDEC’s list of Inactive Hazardous Waste Sites (Site #338036) as a “P” site. The P-site designation is given to sites where preliminary information indicates that contamination may be present at levels which may make it eligible for placement on the Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 significant threat site. This P-site designation prompted the NYSDEC driven Site Characterization activities. In 2008, CDM, a NYSDEC contractor, conducted an investigation of the drum storage area at the City’s DPW site. Test pits and soil borings installed on and adjacent to the IDA’s Scobie Drive parcel identified hazardous substances and petroleum. Hazardous wastes were identified on the DPW property.

In 2012 and 2013, Obrien and Gere, on behalf of Bayer Crop Science and DuPont-Stauffer, under an Administrative Order on Consent with the United States Environmental Protection Agency (USEPA), removed drums and other impacted material from the drum cache area in the City-owned DPW site by DuPont -Stauffer. A portion of the drum removal area (~0.5 acres) extended onto the 5 Scobie Drive parcel. Surface soils and debris and crushed drums were removed from this 0.5-acre portion of the Site. No evidence of hazardous waste was encountered on the 5 Scobie Drive Site during this action and the scope of work was modified to include a less intensive cover system due to the absence of impacts and shallow bedrock. The drum removal action was not performed as part of the investigative work performed by the Department.

2.2 Remedial Investigation

The nature and extent of Site contaminants were identified by the Remedial Investigation (RI), conducted from November 2013 to June 2014, and the Emerging Contaminants Investigations, which were conducted from May 2019 to November 2020. Previous environmental investigations have also been reviewed to characterize the Site.

The RI involved the collection and analysis of surface soil samples; the advancement of test pits and test borings for the collection and analysis of soil samples and to evaluate

the Site's subsurface conditions; the installation of monitoring wells for the collection and analysis of groundwater samples, a leachate assessment, a fish and wildlife assessment and the collection of surface water and sediment samples.

The 2019 and 2020 supplemental PFAS investigations included the collection and laboratory analysis of surface water, shallow soil, and groundwater samples. Additionally, test pits were excavated to expose the soils and waste mass and to collect samples for laboratory analysis. Results for the PFAS investigation are presented in conjunction with RI findings. A detailed description of the Emergent Contaminants Investigations is presented in subsequent sections of this Work Plan.

The primary contaminants of concern at the Site are SVOCs and metals in surface and subsurface soils, groundwater, surface water and sediments. One (1) pesticide (Dieldrin) and PCBs were encountered in sediment sample SED-02 and groundwater sample CTM-MW-4 obtained in the northwest quadrant of the Site. Furthermore, the PFAS investigations documented the presence of PFAS in groundwater. It is C.T. Male's opinion that the PFAS impacts documented in groundwater are primarily migrating onto the Site from upgradient sources. While there appears to be PFAS impacts associated with the historic use of the Site, based on an evaluation of the overall data obtained both on- and off-Site, it is likely that the Site itself is not the primary source of PFAS found in the groundwater beneath the Site.

Analytical results for sampled surface and subsurface soils, groundwater, surface water, and sediment were compared to the site-specific SCOs/SCGs. The following Table 2.2-1 lists those compounds and analytes that exceeded site-specific SCGs for Commercial Use sites along with the frequency that the applicable SCG was exceeded per analyzed media.

TABLE 2.2-1: COMPOUNDS AND ANALYTES EXCEEDING SCGs PER MEDIA TYPE					
Media	Class	Contaminant of Concern	Concentration Range Above SCG	Frequency Exceeding Standard	Applicable SCG
Surface Soils (¹) (mg/kg or ppm)	SVOCs	Benzo(a)anthracene	6.3	1 of 10	5.6
		Benzo(a)pyrene	2.1-5.8	4 of 10	1 ⁽²⁾
		Benzo(b)fluoranthene	8	1 of 10	5.6
		Dibenzo(a,h)anthracene	0.94	1 of 10	0.56
	Metals	Arsenic, Total	16-18	3 of 10	16 ⁽²⁾
		Barium, Total	400	1 of 10	400

TABLE 2.2-1: COMPOUNDS AND ANALYTES EXCEEDING SCGs PER MEDIA TYPE					
Media	Class	Contaminant of Concern	Concentration Range Above SCG	Frequency Exceeding Standard	Applicable SCG
Subsurface Soils ⁽¹⁾ (mg/kg or ppm)	SVOCs	Benzo(a)pyrene	2.5-4.3	2 of 9	1 ⁽²⁾
		Dibenzo(a,h)anthracene	0.64	1 of 9	0.56 ⁽²⁾
	Metals	Arsenic, Total	1.8-54	2 of 20	16 ⁽²⁾
		Barium, Total	500-710	3 of 9	400 ⁽²⁾
		Copper, Total	480	1 of 9	270 ⁽²⁾
		Lead, Total	1,200-14,000	4 of 9	1,000 ⁽²⁾
		Mercury, Total	3.2-32	3 of 9	2.8 ⁽²⁾
Groundwater ⁽³⁾ (ug/L or ppb, with exception of PFAS ng/L or ppt)	Anions	Bromide	329-5760	1 of 10	2,000
		Chloride	20,700-413,000	3 of 10	250,000
	PCBs	Aroclor 1242	0.659	1 of 10	0.09
		Aroclor 1254	0.248	1 of 10	0.09
	SVOCs	1,4-Dichlorobenzene	1-7.6	1 of 10	3
		Bis(2-Ethylhexyl)phthalate)	8.4	1 of 10	5
		Naphthalene	0.08-39	1 of 10	10
		Benzo(a)anthracene	0.17	1 of 10	0.002
		Benzo(a)pyrene	0.1	1 of 10	Non Detect
		Benzo(b)fluoranthene	0.12	1 of 10	0.002
		Chrysene	0.16	1 of 10	0.002
	Metals	Arsenic	29.81	1 of 10	25
		Antimony	0.42-4.29	2 of 10	3
		Boron	196-2,360	2 of 10	1,000
		Iron	3,810-48,700	10 of 10	300
		Lead	0.61-34.64	1 of 10	25
		Magnesium	33,700-73,800	9 of 10	25
		Manganese	273.6-1531	8 of 10	300
		Sodium	25,400-299,000	10 of 10	20,000
	VOCs ⁽³⁾⁽⁴⁾	Chlorobenzene	0.73-70	5 of 10	5
		Benzene	1-9	4 of 10	1
		1,4-Dichlorobenzene	2.2-12	4 of 10	3
		Naphthalene	47	1 of 10	10
		Total PFOA/PFOS	7.7-581	7 of 8 ⁽⁵⁾	10
Surface Water ⁽³⁾ (ug/L or ppb, with exception of	SVOCs	Benzo(a)pyrene	2.4	1 of 4	0.002
		Benzo(b)fluoranthene	0.48-3.5	2 of 4	0.002
		Chrysene	0.26-2	2 of 4	0.002
	Metals	Aluminum, Total	12.1-4,000	2 of 4	100
		Antimony, Total	2.32-36.19	3 of 4	3
		Cobalt, Total	0.93-13.18	1 of 4	5

TABLE 2.2-1: COMPOUNDS AND ANALYTES EXCEEDING SCGs PER MEDIA TYPE					
Media	Class	Contaminant of Concern	Concentration Range Above SCG	Frequency Exceeding Standard	Applicable SCG
PFAS ng/L or ppt)		Iron, Total	4,030-74,900	4 of 4	300
		Magnesium, Total	29,100-43,100	1 of 4	35,000
		Manganese, Total	760.8-7,514	4 of 4	300
		Vanadium, Total	0.29-22.09	2 of 4	14
	VOCs ⁽³⁾⁽⁴⁾	Total PFOA/PFOS	36.7 – 174.0	4 of 4	10
Sediment ⁽⁶⁾ (mg/kg or ppm)	Metals	Arsenic, Total	12-34	2 of 4	>33(3)
		Silver, Total	0.82-4.3	1 of 4	>2.2
		Zinc, Total	120-800	1 of 4	>460

Table Notes:

- (1) NYSDEC 6 NYCRR Part 375 Environmental Remediation Programs, Subpart 375-6 Commercial Use Soil Cleanup Objectives for soils.
- (2) Applicable SCGs shown as Commercial Use SCOs.
- (3) NYSDEC Division of Water Technical and Operational Guidance Series (1.1.1), Ambient Water Quality Standards and Guidance Values and Effluent Limitations, June 1998 for groundwater and surface water.
- (4) NYSDEC Sampling, Analysis, and Assessment of Per and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs, April 2023.
- (5) Total groundwater samples collected in the 2019 and 2020 PFAS investigations.
- (6) NYSDEC Division of Fish, Wildlife and Marine Resources Screening and Assessment of Contaminated Sediment, January 24, 2014; Freshwater Sediment Guidance Values (Table 5 – Class C) and Sediment Guidance Values for PAHs (Table 7).

Refer to Figure 6 – *Surface Soil Parameters Above Commercial Use SCOs* and Figure 8 – *Subsurface Soil Parameters Above Commercial Use SCOs* in Exhibit 2 for sample locations exceeding SCOs. These RIR figures have been updated to depict exceedances above Restricted Commercial SCOs only at the request of NYSDEC in a correspondence dated July 13, 2023.

No soil vapor data was collected as part of the RI. The NYSDEC does not have any SCGs for volatile chemicals in soil vapors. New York State Department of Health (NYSDOH) utilizes several decision matrices for evaluating the potential for soil vapor intrusion. These decision matrices are presented in the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (GESVI), dated October 2006, Updated May

20017. Potentially applicable matrix values and/or elevated concentrations of VOCs will be identified in any future soil vapor data collected for the Site, as deemed necessary by NYSDEC. A vapor intrusion (VI) assessment will be conducted to determine the potential for VI and the need for mitigation measures, if warranted.

2.3 Emergent Contaminants Investigations

Following the completion of the RI Report in 2014, NSYDEC requested additional investigative work to assess the presence of emerging contaminants (ECs) at the Site. The following documents were prepared by C.T. Male documenting additional investigations.

- May 3, 2019, Emerging Contaminants Sampling Report, and
- November 13, 2020, Draft Supplemental PFAS Investigation Report.

C.T. Male sampled three (3) monitoring wells at the Site for emerging contaminants 1,4-dioxane and per- and polyfluoroalkyl substances (PFAS) compounds as part of the 2019 ECs investigation. 1,4-dioxane was detected above EPA and NYSDEC recommended concentrations at the time of sampling (1.0 parts per billion [ppb]) in MW-05 and CTM-MW-2. PFAS compounds were detected in all monitoring wells sampled at concentrations exceeding the USEPA's recommended Health Advisory Level (HAL) concentrations at the time of sampling (70 parts per trillion [ppt]).

Other PFAS compounds were also detected in concentrations that exceed the NYSDOH proposed Maximum Contaminant Limit (MCL) for public drinking water supplies and the NYSDEC recommended value of 10 ppt (ng/L). The report concluded that there were elevated levels of 1,4-Dioxane (peak concentration of 10.2 ng/L or ppt) and PFAS (peak concentration of 561 ng/L or ppt) in the groundwater at the Site. The source(s) of PFAS contamination were unknown. It was noted that the highest concentrations of contaminants were detected near the southern property boundary and upgradient with respect to groundwater flow.

Following the 2019 ECs investigation, supplemental PFAS data was collected in 2020 to further evaluate the extent and source of PFAS contamination at the request of NYSDEC. Representative shallow soil, waste characterization, groundwater, and surface water

samples were collected, and Synthetic Precipitation Leaching Procedure (SPLP) was performed on the waste characterization samples.

PFAS was detected in surface water at concentrations ranging from 36.7 ppt to 174 ppt (guidance level 10 ppt). Groundwater sampling results detected total PFOS/PFOA concentrations ranging from 52 ng/l to 299 ng/l (guidance level 10 ng/L).

The waste characterization samples analyzed using SPLP method detected PFAS at concentrations ranging from 4.07 ng/l to 529 ng/l. There are no standards for SPLP PFAS results.

With regards to PFAS concentrations in soils, it is noted that there are currently only Soil Cleanup Objectives (SCOs) for PFOA and PFOS. Commercial Use SCOs for PFOA and PFOS are 500 ppb and 600 ppb, respectively. Total PFOS/PFOA concentrations was documented in surface soils ranging from 1.94 ppb to 3.06 ppb, below the Commercial Use SCOs.

Based on the data collected in 2019 and 2020, it is C.T. Male's opinion that the PFAS impacts documented in groundwater are primarily migrating onto the subject Site from upgradient sources. While there appears to be PFAS impacts associated with the historic use of the Site, based on an evaluation of the overall data obtained both on- and off-Site, it is likely that the Site itself is not the primary source of PFAS found in the groundwater beneath the Site.

3.0 REMEDIAL ACTION APPROACH

3.1 General

The proposed remedy for the Site is based on the planned future Commercial Use incorporating engineering and institutional controls consistent with 6 NYCRR Part 375 Track 4 cleanup levels as promulgated at 6 NYCRR 375-3.8(e)(4). The available remedies were discussed in the Alternative Analysis (AA) Report dated April 2023, and revised in September 2023 prepared by C.T. Male and submitted under separate cover. Refer to the AA Report for detailed discussion regarding the comparative analysis which identifies the remedy described herein as a cost-effective remedy given the intended future use of the Site that is protective of human health and the environment (Alternative 3 in the AA Report).

Alternative 3 is generalized as “Limited Excavation, Surface Cover, Institutional and Engineering Controls, and Monitored Natural Attenuation of Groundwater Impacts”. The remedial action will include closer evaluation and potential removal of grossly contaminated soils exceeding commercial use soil cleanup objectives and off-Site disposal of hazardous waste, if encountered. The specific elements of the selected remedy are as follows:

- Characterize soils to be removed for waste disposal purposes, specifically the soils in the central portion of the Site with elevated levels of lead and mercury;
- Implement an explosive gas monitoring program beneath the footprint of the proposed building(s);
- Sample (as warranted), manage, segregate, and dispose of on-Site surface materials (i.e., stumps, brush, incidental C&D materials and debris);
- Perform limited excavation(s) and dispose and/or relocate soils exceeding hazardous waste threshold or soils that are not suitable for construction purposes to facilitate development;
- Contain and treat or off-Site disposal of impacted groundwater encountered during construction that may be generated from dewatering activities;
- Install a barrier demarcation layer to define the boundary between clean backfill and contaminated soils;

- Place a surface cover system, inclusive of building foundation and slab, pavement and soils meeting applicable SCOs;
- Install an active sub-slab depressurization system (SSDS) in future on-Site buildings;
- Plant suitable native plants as passive/seasonal leachate controls in portions of the Site where leachate breakouts were documented;
- Conduct environmental monitoring to measure the effectiveness of the remedy and use restrictions/limitations to prevent exposure to remaining contaminants; and,
- Establish institutional controls in the form of an environmental easement restricting future land and groundwater use, and require periodic inspection of Site engineering controls.

3.1.1 Remedial Action Implementation

The following sections provide conceptual detail of proposed remedial actions at the Site. Remedial action shall be coordinated with site construction activities once a proposed construction plan is developed and adopted.

3.1.1.1 Explosive Gas Monitoring and Limited Soil Investigation/Characterization

The following areas warrant additional investigation prior to conducting the remedial action: (1) presence of explosive gas; and (2) limited soil characterization for potentially hazardous soils in the central portion of the Site. The proposed additional investigation/characterization is described in subsequent sections of this Work Plan.

3.1.1.2 Site Clearing and Grubbing

Existing Site vegetation and trees will need to be cleared and grubbed prior to construction. Vegetation situated at and/or above the ground surface will be cleared and disposed of off-Site at an approved disposal facility. Vegetation located below the ground surface (i.e. roots) will be removed, vigorously shaken, and rolled over the ground surface to dislodge bulk soils clinging to the vegetation. Upon approval of satisfactory

soil removal by the remedial engineer (C.T. Male), the subsurface vegetation will be disposed of off-Site at a disposal facility permitted to accept this waste.

3.1.1.3 Surface Placed Solid Waste Materials

There are solid waste materials present across the surface of the Site. Non-reusable solid wastes will be collected and recycled, if possible. Remaining waste will be disposed of off-Site at a NYSDEC approved disposal facility permitted to accept solid waste. Drums, containers or any other containment vessels containing known wastes (i.e., oil, grease, etc.) will be segregated and staged atop 12-mil thick poly and protected from environmental elements (i.e., rain, snow, freeze, etc.) until properly removed from the Site. The wastes will be characterized by the contractor under the prospective Applicant's direction and the remedial engineer's review in accordance with the target disposal facility's permit requirements. Waste profile paperwork shall be reviewed by the remedial engineer and signed by an authorized representative of the Applicant. Waste manifests shall also be reviewed and signed by an authorized representative at the time of waste pickup.

3.1.1.4 Monitoring Well Decommissioning

Site monitoring wells will be decommissioned in accordance with the procedures outlined in DEC CP-43 Commissioner's Policy on Groundwater Monitoring Well Decommissioning. There are 11 monitoring wells, the locations of which are shown on Figure 5 of the RI Report. If possible and practical, at least five (5) monitoring wells will be preserved for groundwater monitoring following remediation. At least one (1) upgradient well and four (4) downgradient wells will be left in place or replaced after construction to provide a mechanism for long-term groundwater monitoring. A final determination on these pre-existing wells or future new wells will be made in consultation with the NYSDEC Project Manager.

3.1.1.5 Initial Site Grading and Surveying

A Site plan for the project is currently being developed. Although a Site plan has not been finalized, it is anticipated that the surface will be rough graded and surveyed following completion of the *Limited Soil Investigation/Characterization*. The Site will be rough graded again following the limited soil excavation at TP-17 (as warranted) and/or in preparation for the placement of the surface cover system. It is anticipated that some

areas of the Site will need to be cut and others filled. The use of existing on-Site material will be evaluated for use as backfill in areas where backfill is needed. A determination regarding the suitability of on-Site materials as backfill will be made in consultation with NYSDEC. If the use of on-Site material is not suitable, clean suitable construction grade fill will be imported to make appropriate grades, minus the required thickness of the soil cover system.

After completion of Site rough grading and prior to the placement of the surface cover system, a professional surveyor licensed to practice in New York State (NYS) will survey the Site to establish elevation before the surface cover system is installed. The purpose of the survey will be to establish survey points for preparing as-built drawings showing the elevations where existing soils will be encountered during future Site development and/or disturbances. The same survey points will be utilized to record the elevation after placement of the surface cover system to document the required surface cover system thickness was achieved. The frequency of survey data points shall be no less than a 30 by 30-foot grid across the Site, but may require more survey points on critical slopes or other variable topography.

3.1.1.6 Surface Cover System

The surface cover system will consist of either 1) imported fill at least 12 inches thick over a demarcation layer; 2) low permeability material (i.e. clay liner or similar material) in the areas proposed as stormwater basins (it is anticipated that stormwater basins will be designed as stormwater management facilities); 3) imported asphalt/subbase (e.g., parking and driveways of future construction) generally 8 inches thick; or 4) poured in-place concrete (i.e., sidewalks and utility foundations of future construction) generally 10 inches thick in aggregate (e.g., 6-inches of clean, compacted sub-base under 4-inches of concrete). Furthermore, a demarcation layer and impermeable layer in selected areas of exposed soils will be installed. Figure 3: Surface Cover Details depicts typical surface cover system design criteria. Additional details on the Surface Cover System will be provided in the Remedial Design Document.

Prior to placement of the surface cover soil system utilizing imported fill (12 inches minimum), a demarcation layer (i.e., woven or non-woven filter fabric, or other material that is approved by the remedial engineer and NYSDEC) will be installed over existing soils to serve as a visual barrier between the bottom of the surface cover soil system and

top of the existing soils. No demarcation layer will be placed in areas proposed for driveways, paved surfaces, parking, stormwater basins or building foundation. However, a demarcation layer can be placed if warranted.

Fill and topsoil imported onto the Site for placement for the surface cover system will require analytical testing as promulgated in Section 5.4(e) of DER-10.

3.1.1.7 Vapor Mitigation Systems

The proposed building(s) will require the installation and operation of a vapor mitigation system consisting of an SSDS in general conformance with *Section 4: Soil Vapor Intrusion Mitigation* of the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006, unless otherwise determined by NYSDOH. The soil vapor mitigation system will consist of active ventilation of sub-slab vapors underneath the building(s) slab with the use of fans, unless otherwise determined by future testing. Additional details on the vapor mitigation system will be provided in the Remedial Design Document.

3.1.1.8 Leachate Mitigation

Three (3) small leachate breakouts were observed at discrete locations along the drainage channel. Mitigation will include reduction of infiltration through Site grading, surface cover system, and planting of suitable native plants as passive/seasonal leachate controls. Leachate Mitigation is described in further sections of this Work Plan.

3.2 Remedial Action Objectives

Table 3.2-1 summarizes the Contaminants of Concern (COCs) within each medium and the remedial action objectives (RAOs) identified for each medium. Per correspondence received from the Department on August 14, 2023, the main RAOs have been limited to groundwater, soil, and soil vapor. The COCs include compounds and analytes which exceeded their respective SCGs.

It is C.T. Male's opinion that with the exception of PFAS (Emerging Contaminants [ECs]) documented in the groundwater at the Site, the source of the COCs is the solid waste and ash material deposited on-Site. It is C.T. Male's opinion that the PFAS impacts documented in groundwater are primarily migrating onto the subject Site from

upgradient sources. While there appears to be PFAS impacts associated with the historic use of the Site, based on an evaluation of the overall data obtained both on- and off-Site, it is likely that the Site itself is not the primary source of PFAS found in the groundwater beneath the Site.

Table 3.2-1: Contaminants of Concern for Site Media and Remedial Action Objectives		
Media Type	COCs	Remedial Action Objective
Near-Surface and Sub-Surface Soil	SVOCs and Metals	RAOs for Public Health Protection Prevent ingestion/direct contact with the contaminated soils, and prevent inhalation of or exposure from contaminants volatilizing from contaminated soil. RAOs for Environmental Protection Prevent migration of contaminants that would result in groundwater or surface water contamination.
Groundwater	Metals, PCBs, SVOCs and VOCs (including PFAS compounds)	RAOs for Public Health Protection Prevent ingestion of the groundwater containing contaminant levels above drinking water standards, and prevent contact with, or inhalation of, VOCs potentially emanating from contaminated groundwater
Soil Vapor	Unknown	RAOs for Public Health Protection Mitigate impacts to public health resulting from existing, or potential soil vapor intrusion into buildings at the Site.

3.3 Remedial Treatment Units

For this project, the entire Site at 5 Scobie Drive is considered one (1) remedial treatment unit, Operable Unit No.1, under the BCP. Operable Unit No.1 encompasses the majority of the Site and defines where remedial work will take place. Operable Unit No.1 extends from Scobie Drive west to the western property line and north from the southern property line to the leading edge of the delineated wetland boundaries. Based on the results of the RI, Operable Unit No.1 surrounds the known buried waste on the Site. The work completed to date has not identified buried waste beyond the wetland, therefore justifying the established limits of Operable Unit No. 1. The location and estimated depth

to the top of native fill (i.e., thickness of buried waste) is shown in Figure 9 of the RI Report. The depth and concentration of contaminants detected by the RI are summarized in the applicable sections of the Remedial Investigation Report.

3.4 USACOE Jurisdictional Determination

Wetlands and other waters of the U.S. under the jurisdiction of the U.S. Army Corps of Engineers (USACOE) were delineated on October 3, 2013 by C.T. Male. In summary, two (2) wetlands; Wetland 1 and Wetland 1A were identified on the project Site. Wetland 1 (approximately \pm 0.20 acres) was delineated along the northern Site boundary, and Wetland 1A (approximately \pm 0.23 acres) was delineated along the northeastern portion of the Site. Dominant vegetation observed within Wetland 1 included red maple (*Acer rubrum*), speckled alder (*Alnus incana*), common reed (*Phragmites australis*), rice cut grass (*Leersia oryzoides*), fireweed (*Lobelia cardinalis*) and duckweed (*Lemna minor*). Soils were observed to be thick and mucky with a brown/black color and slight hydrogen sulfide odor. Wetland hydrology indicators that were observed include high water table (observed at eight [8] inches), water marks, sparsely vegetated concave surface, water-stained leaves, hydrogen sulfide odor, drainage patterns and geomorphic position. Dominant vegetation observed within Wetland 1A included red maple, box elder (*Acer negundo*), common reed, rice cut grass, fireweed and creeping jenny (*Lysimachia nummularia*). Soils and hydrology in Wetland 1A were observed to be similar to Wetland 1.

A request for a jurisdictional determination (JD) was made to the USACOE on June 12, 2014. On August 20, 2014, a representative of the USACOE field reviewed the boundaries of wetlands and other waters of the U.S. A JD from the USACOE was received on October 14, 2014 (refer to Exhibit 3, Jurisdictional Determination from USACOE). The approved JD identifies a total of 0.43 acres of contiguous wetlands on the project Site which are part of a tributary system considered to be waters of the U.S.

No NYSDEC Freshwater Wetlands were identified on or near the project Site.

All development plans for the project Site avoid impacts to the two (2) identified jurisdictional wetlands. Since there is no plan to “fill” either of the two (2) identified jurisdictional wetlands, no wetlands permit is required from the USACOE as part of the proposed Site development plans.

3.5 Applicable NYS Standards, Criteria and Guidance (SCGs)

The contemplated use for the Site is “Commercial Use”. The applicable SCGs for each media to be used for remedial action are summarized as follows:

Media	Regulation	SCGs
Soil*	6 NYCRR Part 375 (December 14, 2007)	Table 375-6.8(b) Commercial Use Soil Cleanup Objectives
Groundwater*	NYSDEC Division of Water TOGS 1.1.1	Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations (June 1998) – Class GA Fresh Groundwater
Soil Vapor	None	Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, dated October 2006 (inclusive of subsequent revisions), Updated May 2017

Furthermore, as specified in Sampling, Analysis, and Assessment of Per and Polyfluoroalkyl Substances (PFAS) Under NYSDEC’s Part 375 Remedial Programs (dated April 2023), “all work plans submitted to DEC pursuant to one of the remedial programs under Part 375 shall include PFAS sampling and analysis...”. PFAS guidance will be applicable to the Site remediation, as warranted.

The remedial action does not include active provisions for the remediation of PFAS or 1,4 Dioxane in the groundwater. It is C.T. Male’s opinion that the PFAS impacts documented in groundwater are primarily migrating onto the subject Site from upgradient sources. While there appears to be PFAS impacts associated with the historic use of the Site, based on an evaluation of the overall data obtained both on- and off-Site, it is likely that the Site itself is not the primary source of PFAS found in the groundwater beneath the Site. Currently NYSDEC is evaluating PFAS data for adjoining properties and surrounding area to determine what impacts at the Site are derived from these off-Site areas.

A copy of the December 14, 2007, 6 NYCRR Part 375 Table 375-6.8(b) is included in Appendix B for reference. The SCO (a.k.a. SCG) for Restricted Use – Commercial are identified under the column heading “Protection of Public Health – Commercial”. The NYSDEC Division of Water TOGS 1.1.1 document is not included, but the standard or guidance values for the remedial action will be the Class GA fresh groundwater.

Currently, there is no regulation that establishes SCGs for soil vapor investigation or mitigation. In lieu of a regulation, the NYSDOH prepared guidance document listed in the Table above will be used for applicable SCGs, if necessary.

3.6 Remedial Action Schedule

It is expected that Site development project field work will be completed by the end of the calendar year 2026. To meet this construction schedule, the following schedule is proposed.

- Submit AA Report and RAWP to NYSDEC for review by April 2023.
- Submit Revised AA Report and RAWP to NYSDEC following agency comments by September 2023.
- Obtain general acceptance of documents for public review by September/October 2023.
- 45-Day Public Comment Period until December 2023 which includes NYSDEC preparation of Decision Document and Fact Sheet.
- NYSDEC issues Decision Document and remedy may begin on or about January or February, 2024.
- Site development process with the City of Newburgh from March 2024 to March 2025 (not part of the BCP process).
- Conduct site development work (mostly subgrade work and surface work like slabs, sidewalks, etc.) from March 2025 to June 2026.
- Submit completed draft Environmental Easement by July 2026.

- Execute Environmental Easement by August 2026.
- Submit draft Site Management Plan by September 2026.
- Submit draft Final Engineering Report by October 2026.
- Submit final Site Management Plan by November 2026 or some other agreed upon date that is pre-approved by the Department.
- Submit Final Engineering Report by December 2026 or some other agreed upon date that is pre-approved by the Department.

3.7 Public Participation

Public participation has been conducted as part of the BCP starting with the BCP Application in 2013. Public participation will continue on this project with a public comment period, placing documents in the repository and issuing a notice/fact sheets, as follows:

- Once approved by the NYSDEC, place this RAWP and AA Report in the document repositories prior to the public comment period. These documents will be preliminarily reviewed by NYSDEC for general acceptance, then a more formal review will be performed by NYSDEC during the comment period; providing comments before the documents are made final.
- Issue a notice for the start of a 45-day public comment period for this RAWP and AA Report.
- Issue a public notice/fact sheet for the start of remedial/construction work.

NYSDEC approval of this RAWP will follow the public comment period unless a public meeting is requested and deemed necessary by NYSDEC. If needed, a public meeting will be held toward the end of the 45-day comment period to explain the project in further detail, answer public questions and hear public comments.

3.8 Sub-slab Depressurization System (SSDS)

3.8.1 Design Requirements

Given the waste materials to remain beneath the future building(s), there is potential for sub-slab soil vapor to be present. As such, there is a mandatory requirement to design and install an active sub-slab depressurization system to mitigate the potential for sub-slab soil vapor intrusion. The system shall be designed by a licensed professional in accordance with applicable regulations, USEPA and NYSDOH guidance, industry practices, and sound engineering judgment. The system shall include pressure differential monitoring and backup power systems to ensure the system is working properly and there is uninterrupted adequate performance.

As part of the design, permanent sampling points or access ports will be installed in the building's concrete floor slab. The penetrations will be resealed to avoid serving as a conduit for sub-slab soil vapor that might enter the building interior.

Additional details on the vapor mitigation system will be provided in the Remedial Design Document.

3.8.2 Soil Vapor Intrusion Evaluation

After the installation of the SSDS and prior to the building occupancy, a soil vapor intrusion evaluation will be performed. Sampling methods and procedure shall follow the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York dated October 2006, updated May 2017. The initial sampling event shall include testing for volatile organic compounds for TO-15 Selected Ion Monitoring (SIM) list of parameters at all sampling locations. Subsequent annual sampling events may be reduced, dependent on the results of the initial sampling and in consultation with NYSDOH. The sub-slab sampling should include indoor ambient air samples (coupled with other sub-slab soil vapor sample locations) and outdoor ambient air samples.

Prior to sampling, a work plan shall be developed in accordance with NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York dated October 2006, updated May 2017, for NYSDEC and NYSDOH approval. The work plan shall describe, at a minimum, the equipment to be used, procedures for validating adequate seal at the sub-slab soil vapor sampling location, and length of sampling period.

3.8.3 Termination

The active SSDS will not be discontinued unless prior written approval is granted by the NYSDEC and NYSDOH. If monitoring data indicates that the SSDS is no longer required, a proposal to discontinue the SSDS will be submitted by the Site owner to NYSDEC and NYSDOH.

3.9 Monitored Natural Attenuation

Groundwater monitoring activities to assess natural attenuation will continue post-remediation and Site development, as determined by the NYSDEC, until residual groundwater concentrations are found to be consistently below NYSDEC standards or have become asymptotic at an acceptable level over an extended period. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional treatment and/or control measures may be evaluated.

4.0 PRE-REMEDIAL ACTION TESTING

4.1 General

The following areas warrant additional investigation prior to conducting the remedial action: (1) presence of explosive gas; and (2) soil characterization for potentially hazardous soils in the central portion of the Site. The following section describes the means and methods of additional investigative sampling.

4.2 Explosive Gas Monitoring

During the winter months, when the ground is frozen, explosive gas monitoring shall be performed to determine if explosive gas is present in the subsurface emanating from the buried waste material. This sampling is intended to mimic future conditions when the future building(s) is installed to determine if there is potential for explosive gases to be present. The results of the explosive gas monitoring shall be used by the licensed professional designing the SSDS.

The explosive gas monitoring should include multiple sampling locations within the footprint of the proposed building(s). At a minimum, six (6) to eight (8) sampling locations should be selected. The explosive gas monitoring shall be performed by installing temporary expendable points connected to polyethylene tubing advanced to at least two (2) feet below grade. If possible, the sampling point should be sealed at grade to mitigate influence from ambient air. The readings shall be collected with a 4-gas meter calibrated to known standard gases. Results will be provided to NYSDEC and NYSDOH for review.

4.3 Limited Soil Investigation/Characterization

Soils in the central portion of the Site (at/near TP-17) with elevated levels of lead and mercury significantly exceed Commercial SCOs and have the potential to be hazardous. The limits of the potentially hazardous waste would be defined, and a determination made for the need for off-Site disposal. The following preliminary sampling plan has been developed.

Nine (9) soil borings or test pits will be advanced at and in the vicinity of former test pit TP-17 to facilitate collection of subsurface soil samples. One (1) boring/test pit will be

advanced just outside the limits of the original TP-17 excavation, and two (2) borings/test pits will be advanced at 10 to 20-foot intervals in the four (4) cardinal directions (north, south, east and west) from the center of TP-17 to delineate horizontally. A minimum of three (3) depth interval composite samples will be collected from each soil boring/test pit as follows:

- From the boring/test pit located just outside former test pit TP-17: Four (4) samples will be collected from depth intervals 0-2 feet composite, 1.5 feet discrete, 2 -4 feet composite, and 4-6 feet composite.
- Remaining borings/test pits: Three (3) samples will be collected from the following depth intervals 0-2 feet composite, 2 -4 feet composite, and 4-6 feet composite.

Upper interval samples (above 2 feet) will be analyzed for total lead, total mercury, and Toxicity Characteristic Leaching Procedure (TCLP) for lead and mercury. Lower interval samples will be placed on hold pending further direction. An assessment of the upper interval data will be performed to determine if lower interval analysis is required to continue vertical delineation for lead and/or mercury. Samples may be collected from additional depth intervals that exhibit subjective field evidence of contamination as warranted.

The inferred soil volume that could potentially be deemed hazardous, requiring removal and off-site disposal has been estimated to be between 200 to 2,000 cubic yards, in the absence of delineation analytical data. This soil volumes estimate is preliminary and should not be relied upon for remediation purposes. Delineation will be performed in the future as a remedial action task. Soil volumes may change based on the limited soil investigation/characterization.

The site shall be graded and surveyed in accordance with Section 3.1.1.5 following completion of the Limited Soil Investigation/Characterization.

5.0 TEMPORARY CONSTRUCTION FACILITIES

5.1 Site Security

Fencing and other means of site control shall be installed at a minimum along the eastern property lines adjacent to Scobie Drive during the remedial action. Access from the south is prevented by controlled entry through the DPW property. The northern and northwestern property boundaries abut Interstate 84. The potential exists for the public to enter the Site from the north and northeastern portion of the Site. The wetland along this property boundary provides a natural barrier. If during completion of the remedial action evidence exists of trespass, additional means of Site control (i.e., additional fencing) shall be installed.

Throughout the project it might be possible to adjust Site security whereby the fence may be relocated to the boundaries of Operable Unit No. 1. This should not occur until public access/contact to environmental impacts (soil and exposed waste) are controlled.

The type of fencing will be determined by the general contractor. The fencing selected shall be effective in controlling unauthorized entry and direct interested persons to the main entrance and construction trailers for check in with Site personnel during construction.

5.2 Trailers

During the completion of the remedial action, battery powered electronic monitoring equipment is required to field screen soils for contamination and monitor the air for dust. The persons completing this work will need access to a suitable and clean work area such as a construction trailer for field notes preparation, charging equipment batteries and downloading data logged on the equipment for record storage and submission to NYSDEC and/or NYSDOH. The construction office trailer(s) should be equipped to support the use of electronic equipment such as a desk and multiple outlets for plugging in equipment chargers.

The trailer shall be of sufficient size to include a table and chairs to support construction related progress meetings. The trailer shall also be the repository for construction plans,

health and safety plans, stormwater management reports and plans, and this RAWP at a minimum.

5.3 Decontamination Equipment

Construction equipment that comes into contact with Site soils/buried waste shall be considered contaminated. Prior to this equipment being demobilized from the Site or transferred from designated contaminated areas (existing soils and exposed waste areas) to non-contaminated areas (i.e., backfilled with clean imported fill), the equipment must be decontaminated in a manner that removes adhered soils.

Dry decontamination procedures, such as the controlled physical removal of soils adhered to the tracks of the excavator and excavator bucket, and the tires of soil loadout trucks, will be employed based on-Site conditions. If dry decontamination is not suitable, washes/rinses of the equipment in a controlled manner will be employed thereby capturing soils and wash/rinse water for proper off-Site disposal.

The decontamination can be localized to tires and truck beds if the material is visually contained to those parts of the construction equipment. The waste soils and wash/rinse water shall be captured using a stationary or movable decontamination pad. The accumulated soils and water shall be kept in the decontamination area and protected from release to the environment or transferred to 55-gallon drums daily to mitigate the potential for intermixing with precipitation and increasing the volume for disposal or overflowing the decontamination pad.

The drum contents shall be characterized through generator knowledge, analytical testing from the remedial investigation and/or additional lab testing of the actual waste in accordance with the target disposal facility's permit requirements. Waste profile paperwork shall be reviewed by C.T. Male and signed by an authorized representative of the Site owner.

Trucks entering and exiting the Site will be subject to the requirements of the Site-specific erosion and sediment control measures outlined in this RAWP and site-specific Stormwater Pollution Prevention Plan (SWPPP), which shall include the requirements of a stabilized construction entrance to mitigate fill/soil from being tracked off-Site and onto roadways. The public roadway(s) where trucks exit the Site will be monitored by the

Remedial Engineer's field representative. If fill/soil tracking is apparent, improvements to the erosion and sediment controls and fill/soil loading procedures will be required and implemented. Trucks entering and exiting the Site will also conform to the Site's State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity.

5.4 Construction Entrance

A stabilized construction entrance(s) will be installed in accordance with a Site-specific SWPPP to mitigate the tracking of potentially contaminated fill/soil onto public rights-of-way from vehicle traffic exiting the Site.

5.5 Solid Waste Handling

Solid waste materials are expected to be encountered during the Site development project grading activities and excavation of stormwater management permanent pool retention basins. The solid waste is expected to be inert materials including plastics, metal, remnant and discarded carpet, vinyl waste, wood waste, tires, general municipal solid waste and coal/incinerator ash. Management of these materials shall be to keep the materials in their original location wherever possible and, when material is displaced and relocated to meet Site development grading plans, the waste shall be handled minimally and located to a pre-defined waste storage area within the Operable Unit. Waste relocation areas will be determined upon completion of the Site plans.

During the handling of solid waste, attempts shall be made whenever possible, to consolidate and possibly recycle certain materials off-Site. Items proposed for recycling may include metal, wood, plastic (if these can be segregated easily) and tires.

5.6 Unknown Waste Handling

The potential for encountering unknown waste is likely. When excavating in new areas for the first time, excavation equipment shall be used to expose and turn over soils/waste. Construction workers should remain at a safe distance until the material is exposed and identified. Those with the proper health and safety training, such as a remedial contractor contracted and on call, should assess the unknown material. The Contractor and/or its designated remedial contractor shall take appropriate means and measures to

promptly handle unspecified and potentially hazardous wastes, drums or containers encountered during excavation. Drums and containers that contain liquid or material that may be hazardous shall be placed in overpack containers or stored on and under plastic cover until the suspect material can be categorized. Further disturbance or relocation of the materials shall be based on the results of field screening, testing as warranted, ambient air monitoring, or items such as identifying labels on the drums or containers and materials and chemical testing.

5.7 Hazardous Waste Handling

If unknown waste (i.e., drums with liquid or solid material, unusual colored waste, highly odorous materials) is chemically tested or otherwise determined to be defined as hazardous waste (i.e. soils in the central portion of the Site tested prior to the remedial action), these materials will not be allowed to remain on-Site beneath the surface cover system. Hazardous waste shall be removed from the excavation areas and staged in a controlled manner protected from the being struck by construction traffic and being affected from precipitation until disposal arrangements can be made. The hazardous waste storage area on-Site shall be labeled, and waste shall be properly disposed of in less than 180 days from being placed in secure containers as required under hazardous waste regulations.

If hazardous waste is encountered or identified, an USEPA ID Number shall be solicited from USEPA for management. Hazardous waste disposal should occur in a prompt manner as to not exceed 180 days from the initial discovery of the waste. The Owner's representative shall request this number on behalf of the Owner using USEPA's Form 8700-12, Notification of RCRA Subtitle C Activity.

5.8 Groundwater Dewatering During Construction

It is anticipated that dewatering might be needed throughout construction, particularly during the installation of the required clay liner for the proposed stormwater basins. Although, preliminary Site plans are currently in progress. It is anticipated that stormwater basins will be designed as stormwater management facilities. The preliminary Site plans submitted for approval to the City of Newburgh Planning Board will include details of the NYSDEC approved remedy.

Dewatering and discharge will require special handling and treatment. The method of dewatering and containment/treatment has not been determined. Groundwater encountered during construction must be considered contaminated and will require treatment or proper disposal unless chemical testing can document that the applicable environmental quality standards have been met. The Remedial Design Document will include specifications and drawings as required to depict the means and methods of handling, treatment, and discharge or dispose of dewatering effluent generated during construction.

Allowable means of handling contaminated groundwater generated from excavation dewatering may include the following:

- Discharge the treated water to the closest connection to the municipality's stormwater collection system. Applicable permitting requirements and discharge standards would be provided by the municipality (City of Newburgh) and followed.
- Contain untreated water in temporary holding tanks and bulk transport off-Site to a disposal facility permitted to accept the waste. If deemed necessary by the accepting facility, characterization of the water through chemical testing would be implemented prior to removal from the Site. The results of the testing (if warranted) shall be provided to the accepting facility for pre-approval to deliver.
- Request authorization from NYSDEC Project Manager for the on-Site, short-term release of treated water from dewatering activities in batches. Discharges must meet NYSDEC's Groundwater Effluent Criteria provided in Appendix B.

If the later alternative is proposed (on-Site, short-term release of treated groundwater in batches), the following implementation steps are proposed:

1. Design of a dewatering treatment system to be reviewed and approved by NYSDEC.
2. Samples will be collected prior to each discharge event of up to 20,000 gallons. Discharge may not commence until the sample results show compliance with NYSDEC's Groundwater Effluent Criteria or other criteria deemed appropriate by NYSDEC.

3. Only waters generated at the Site during sampling, pump tests, well development, or dewatering of excavations, are authorized for treatment and discharge.
4. Samples and measurements, to comply with the monitoring requirements specified above, must be taken from the holding tank prior to discharge to groundwater.
5. Discharge may not occur unless the ground is capable of accepting the treated effluent. The discharge water may not be ponded on top of saturated or frozen ground or permitted to flow across the ground surface. A minimum separation distance of 100 feet must be maintained between the discharge location and any surface waters (including wetlands). Alternatively, a SPDES permit to discharge treated groundwater to the adjacent surface water body could be evaluated, if the treated effluent meets the Class D stream discharge limits. The consideration of this option will depend on the water quality and volume likely to be generated.
6. Discharge is not authorized until such time as an engineering submission showing the method of treatment and discharge is approved by the NYSDEC. The discharge rate may not exceed the effective treatment system or ground adsorptive capacity, if applicable. All monitoring data, engineering submissions and modification requests must be submitted to the NYSDEC Project Manager.

5.9 Addressing Source Material(s)

The remedial program must address sources which are defined as free-phase product, concentrated solid or semi-solid hazardous substances, dense non-aqueous phase liquid, light non-aqueous phase liquid and/or grossly contaminated soil. Depending on the source material, it may be addressed by 1) removal and/or containment, 2) containment, 3) elimination of exposure, or 4) mitigation of exposure. The buried waste defined above, if present on-Site, is proposed to be addressed by containment. However, alternative treatment measures may have to be evaluated as the material is exposed during the remedial construction process. Decisions on removal, containment or level of exposure will be made with input from the NYSDEC's Project Manager.

If a potential source is identified, the source shall be evaluated in-place to make a preliminary determination whether it meets the criteria for off-Site disposal. If it is

evident that it is grossly contaminated, it will be removed and staged on poly and covered with poly until the disposal requirements can be determined. Site soils will not be considered grossly contaminated unless field screening with a photo-ionization detector, subjective olfactory observations and/or possible analytical testing of the soils, if necessary, indicates otherwise.

The handling of grossly impacted soils could include direct loading into dump trucks or trailers, and if not directly loaded and sent off-Site, it would be stockpiled on-Site in a grossly contaminated soil management area, which shall be underlain by a minimum of 12-mil plastic. The grossly contaminated soil would be covered with 12-mil plastic to limit precipitation infiltration. For directly loaded soil, the trailers shall be covered during transport, and, if the grossly contaminated soil is high in moisture content where free-standing water will be released, the truck gates must be sealed and the bed lined with plastic. Trucks must have solid covers (not mesh) during transport.

Prior to off-Site disposal, samples will be obtained from the grossly contaminated waste for disposal characterization purposes. The analysis shall be in accordance with the target disposal facility's disposal permit requirements, and if unspecified, shall be for the Full TCLP parameters and RCRA characteristics.

Waste material with elevated levels of SPLP for Total PFOA/PFAS is not anticipated to be removed at this time. Additional information is needed to further evaluate the nature and extent of PFAS contamination associated with adjoining properties and surrounding area. Currently NYSDEC is evaluating PFAS data for adjoining properties and surrounding area.

A Stormwater Pollution Prevention Plan (SWPPP) shall be prepared as part of the Site Plan preparation for City approval. Methods for stockpiling soil shall be specified in the SWPPP, including, but not limited to:

Stockpiled soils shall be placed on and under anchored/weighted plastic and surrounded with a berm and/or silt fence. Hay bales shall be placed as needed, near catch basins, surface waters and other discharge points. Stockpiles shall be inspected weekly and after every storm event. Records of these inspections shall be maintained. Refer to Section 6.1 for further information.

5.10 Leachate Seeps Management and Control

The plan to control existing leachate seeps consists of a primary action and contingency plans if the primary action does not adequately limit the leachate seeps. As presented in the remedial investigation, a total of three (3) potential leachate seeps have been identified by the presence of orange-stained soil and/or liquid seeps along the drainage channel. The locations of the seeps are identified on Figure 6 of the RI report and Exhibit 2 of this RAWP.

5.10.1 Primary Action - During Construction

The primary action for control of the leachate seeps is the grading of the Site. Grading of the Site and the installation of impermeable surfaces including the building, parking areas, sidewalks and low permeability material underlying the stormwater detention basins should substantially alter the amount of precipitation that currently infiltrates into the Site. Stormwater will be directed into the stormwater management facilities (detention basins) and be discharged into the drainage channel that runs along the base of existing landfill slope. The net effect of these site development activities will serve to decrease the infiltration of stormwater into the waste mass, thereby, potentially reducing the flow of leachate at the Site.

It is anticipated that stormwater basins will be designed as stormwater management facilities. The intent of these basins is to collect stormwater runoff from the new proposed building and parking area. Prior to construction, stormwater would have otherwise infiltrated the Site through the vegetated surface. With the installation of a building, pavement and basins underlaid with low permeability materials (proposed clay liners or similar materials) there will be a significant reduction in the amount of stormwater infiltration. Furthermore, installation of a demarcation layer and impermeable layer in selected areas of exposed soils will further reduce the amount of stormwater infiltration.

Additional direct action that may reduce leachate flow includes excavation during the installation of subgrade utility structures. During installation, it is anticipated that any subgrade features causing preferred migration pathways for surface infiltration, such as rolled up carpet waste, layered vinyl deposits or other similar unknown subsurface conditions causing channelized flow can be addressed. If such conditions causing

channelized flow are identified, the offending waste structure or materials will be removed or replaced to prevent a preferred pathway for leachate flow.

Leachate collection or treatment is not proposed as part of the primary action. By lessening stormwater infiltration and excavating and regrading the areas surrounding the observed seeps, it is anticipated that the outbreaks will be reduced or potentially eliminated. While unlikely to be needed, other options could be considered, as warranted.

The Site is bordered on the upgradient southern property boundary by a larger former landfill (currently City of Newburgh DPW facility). Based on C.T. Male's staff observations and previous reports, it is our understanding that the DPW facility is not controlled and is covered with permeable fill. The potential for infiltration through this landfill mass (DPW facility) is high and leachate generated beneath the waste material at this facility will likely migrate northward below the 5 Scobie Dive Site. Regardless of the remedial activities employed at the Site, there will likely be contributions from the City DPW facility.

5.10.2 Secondary Action - Post Construction

During the later parts of construction and after the Site has become permanently stabilized with an established vegetative cover, routine inspections of the embankment along the drainage channel where the leachate outbreaks were observed will be performed to assess leachate outbreaks and determine further actions. Planting of suitable native plants as passive/seasonal leachate controls in the leachate outbreak areas and in upland areas with the objective of reducing the flow of leachate.

The effectiveness of the passive/seasonal leachate control will be limited by the season. However, it is anticipated that in conjunction with other proposed engineering controls (surface cover system limiting the amount of water infiltration) and institutional controls (restricting site access to the drainage ditch and swales) this measure will provide a measure of leachate control.

Plantings of unique shrubs and trees that are predisposed to high evapotranspiration rates are proposed. Such plantings could include poplars and willows that are known for high absorption rates. A determination regarding the type, location and maintenance of planting will be made in conjunction with NYSDEC.

6.0 SITE CONTROLS DURING REMEDIAL ACTION

6.1 Stormwater Management

The cumulative area of soil disturbance for this project is anticipated to be greater than one acre requiring the Applicant to obtain coverage under the State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity before commencing construction activity.

In accordance with the New York Guidelines for Urban Erosion and Sediment Control and the New York State Stormwater Management Design Manual, erosion and sediment control measures, pollution prevention measures, and as applicable, post-construction water quality treatment and presented in the form of SWPPP as part of the Site plan preparation for City approval.

The following forms shall be completed and submitted to comply with the requirements of the General Permit for Stormwater Discharges from Construction Activity - GP-0-20-001:

- Notice of Intent (NOI) to NYSDEC, which is a request for coverage under the General Construction Stormwater Permit;
- SWPPP Acceptance Form, which is required along with the NOI because the site is located within the boundaries of an MS4. The SWPPP must be reviewed and accepted by the MS4 prior to submitting the NOI to the NYSDEC; and
- Notice of Termination (NOT) to NYSDEC, which is a notification that the construction project is complete and has met the requirements of the construction permit.

The NOI, SWPPP Acceptance Form and NOT will be prepared after Site plan approval is received from the City of Newburgh. The SWPPP, NOI and SWPPP Acceptance forms will be provided to NYSDEC under separate cover after approval from the City of Newburgh, but prior to start of construction. The NOT will be provided to NYSDEC upon completion of the Site disturbance portion of the project.

6.2 Air Monitoring

A Community Air Monitoring Plan (CAMP) shall be followed during ground intrusive remedial activities (i.e., excavation and handling of site soil/waste). The intent of CAMP is to provide a measure of protection for downwind sensitive receptors including nearby occupants of local residences and businesses, on-Site workers and workers not directly involved with the subject work activities from potential airborne contaminant releases as a direct result of remedial work activities. The CAMP is not intended for use in establishing action levels for worker respiratory protection. The CAMP will monitor the air for dust (particulate air monitoring, see Section 6.2.1) and volatile organic compound vapors (VOC air monitoring, see Section 6.2.2) at the downwind perimeter of the work area. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown.

6.2.1 Particulate Air Monitoring

Three (3) real-time particulate monitors capable of continuously measuring concentrations of particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) will be utilized. The instruments will be placed at temporary monitoring stations based on the prevailing wind direction each day, one (1) upwind and two (2) downwind of the designated work areas. The locations will be concentrated to the north, south and east property lines.

The particulate monitoring instruments will be connected to electronic telemetry for remote monitoring of the short-term exposure limit (STEL) or 15 minute averaging period, as well as all other parameters that the instrument reads. The recorded data will be monitoring on a laptop maintained in the construction trailer and the notifications can be set to send to email, text message or both. Instantaneous readings are also recorded, and all data is stored through the website for the duration of the project.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m³ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration.

In the event of poor weather such as heavy rain, particulate monitoring will not be performed for protection of the instrumentation. These weather conditions would limit the effectiveness of the sensitive monitoring equipment and likely suppress particulate generation, if present. Work activities will be halted if fugitive dust migration is visually observed for a sustained period.

6.2.2 Volatile Organic Compound Air Monitoring

The contaminants of concern for the Site include petroleum products, which are volatile and semi-volatile organic compounds that have the potential to be released to the environment when disturbed. VOC monitors (MiniRAE 3000s or comparable equipment) will be included in the protective enclosures with the particulate monitors. Upwind concentrations will be measured based on wind direction to evaluate the Site's background conditions.

The VOC monitors will also be connected to electronic for remote monitoring of the short-term exposure limit (STEL) or 15 minute averaging period, as well as all other parameters that the instrument reads. This website is capable of setting notifications when readings exceed the NYSDOH Generic Community Air Monitoring Plan action levels for particulates, as listed below. The recorded data will be monitored on a laptop maintained in the construction trailer and the notifications can be set to send to email, text message or both. Instantaneous readings are also recorded, and all data is stored through the website for the duration of the project.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area, exclusion zone or at the property boundary exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily

decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

- If total organic vapor levels at the downwind perimeter of the work area, exclusion zone or at the property boundary persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown. Work activities will then be evaluated to determine the source and engineering controls required to reduce/eliminate organic vapors.

6.3 Noise and Vibration Control

There is potential for noise and vibration to be an issue depending on the means and methods selected by the construction contractor to excavate the Site soils for site development. If sheet piling is used to facilitate excavation of Site soils (not anticipated), this RAWP will require the contractor to plan for and provide, as necessary, controls to mitigate noise and vibration from adversely affecting the community.

6.4 Dust Control

Dust suppression techniques will be implemented as necessary to control fugitive dust to the extent practical during remediation and construction activities. Such techniques must be employed, at a minimum, if the community air monitoring results indicate that particulate levels are above action levels. All reasonable attempts will be made to inhibit visible and/or fugitive dust emissions. Techniques to be utilized by the contractor may include one or more of the following:

- Applying water to haul roads.
- Wetting equipment and excavation faces.

- Spraying water on buckets during excavation and dumping.
- Hauling materials in containers or vehicles with tarps installed.
- Restricting vehicle speeds on-Site.
- Covering excavated areas and materials after excavation immediately after activity ceases.

The contractor will be required to perform dust control measure in a manner consistent with the applicable portions of the “New York Guidelines for Urban Erosion and Sediment Control” and the “New York State Stormwater Management Design Manual”.

6.5 Odor Control

Nuisance odors may be encountered during the implementation of the remedy and during the disturbance of existing Site soils/waste. If nuisance odors are noted during future Site excavation work, the contractor should be prepared to implement actions to mitigate off-Site impacts from odors.

The means and measures of odor control should be capable of controlling emissions of nuisance odors off-Site and on-Site. Specific odor control methods to be used could include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) daily cover of odorous soils/waste; (e) use of chemical odorants in spray or misting systems; (f) implement monitoring for odors in surrounding neighborhoods, and (g) removing the offending materials from the site to an approved disposal facility.

If nuisance odors are identified at the Site boundary, or if odor complaints are received, work shall be halted, and the source of odors will be identified and corrected. Work will not resume in the impacted area until nuisance odors have been abated or otherwise controlled. The NYSDEC Project Manager shall be notified if odor events, and odor complaints are received.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-Site conditions or close

proximity to sensitive receptors, NYSDEC will be consulted, and an acceptable means of continuing excavation will be developed.

6.6 Environmental Construction Observation and Certification

Full-time observation during subsurface disturbance of existing soils/waste for the purpose of constructing building foundations, installation of stormwater management basins, groundwater dewatering and installation of the surface cover system will be employed. The timeframe of discontinuing full-time observation by the remedial engineer will be discussed with the Applicant and NYSDEC, prior to suspending full-time remedial observation.

Periodic observation and general oversight by a registered professional engineer is required for remedial actions. The project environmental engineer must have prior remediation experience and will certify that the remedial work is completed in accordance with the requirements outlined in this RAWP. The project environmental engineer will also be responsible that the staff performing environmental construction observation does so in accordance with the requirements outlined in the NYSDEC-approved RAWP. The project environmental engineer shall also perform the engineering review of remedial related contractor submittals and field changes for the remedial related work.

7.0 HEALTH AND SAFETY PLAN (HASP)

Each contractor planning to work on any construction work related to the disturbance of existing Site soils/waste shall be responsible for preparing a Health and Safety Plan (HASP) in compliance with NYS DER-10, and 29 CFR 1910, 29 CFR 1926, and applicable Federal, State and local regulations. Each contractor shall provide a Site-specific HASP that is certified by a Certified Industrial Hygienist or Certified Safety Professional. The contractor's employees will be required to have read and understood their company's Site-specific HASP and completed the required training prior to completing the work.

C.T. Male will conduct work in accordance with the HASP provided in Appendix C prepared specifically for the 5 Scobie Drive Project. This HASP is a modified version of the HASP that was prepared for the remedial investigation. It has been modified to address the specific tasks outlined in this RAWP and incorporate relevant changes since the completion of the remedial investigation. It includes those specific remedial tasks that were not already addressed within that plan.

The Site work contractor or any contractor working on-Site during the disturbance of existing soils/waste shall develop and implement an Air Monitoring Program (AMP) for its personnel. The AMP shall be used by the contractor to determine the proper level of personnel protective equipment to use, and to document that the level of protection utilized is adequate. The contractor will be responsible for assuring levels of organic vapors and particulates during intrusive Site work and backfilling do not exceed established action levels indicated in New York State Department of Health's Generic Community Air Monitoring Plan.

A copy of the health and safety plans shall be available at the Site during the performance of remedial activities to which they are applicable.

8.0 CONFIRMATION AND DOCUMENTATION SAMPLING

8.1 Post-Remediation Confirmation Sampling

Post-remediation verification soil samples are not specifically proposed as part of the RAWP; however, under certain circumstances they might be warranted, such as after removal of unexpected grossly impacted sources or hazardous waste removal, if identified. The sampling is intended to document that the Commercial Use SCOs have been met. The following analytical parameters, or NYSDEC-approved subset, will be selected based on the type of materials encountered:

- Petroleum Impacted Sources: Target Compound List (TCL) volatile and semi-volatile organic compounds by EPA Methods 8260 and 8270, and Target Analyte List (TAL) metals by EPA Method 6010 (without cyanide)
- Hazardous Wastes: TCL volatile and semi-volatile organic compounds by EPA Methods 8260 and 8270, pesticides by EPA Method 8081, PCBs by EPA Method 8082 and TAL metals by EPA Method 6010 (without cyanide).

The analytical results will require NYSDEC ASP Category B Data Deliverables and the most recent version of NYS EQulS electronic data deliverables (EDDs).

The frequency of post-remediation confirmatory soil sampling, if warranted, shall be determined at the time of sampling in consultation with the NYSDEC Project Manager. The sampling frequency shall be consistent with NYSDEC DER-10 guidance.

The analytical results will be subjected to data validation. Data validation will be performed in accordance with the USEPA National and Regional Validation Guidelines/Procedures to determine the applicable qualifications of the data. The validator will then prepare a Data Usability Summary Report (DUSR) in accordance with NYSDEC guidance. The DUSR will be prepared for each sample delivery group analyzed by the laboratory. A comprehensive summary of the multiple DUSRs generated throughout the project will be described in the Final Engineering Report.

8.2 Groundwater Treatment Documentation Sampling, If Applicable

Groundwater treatment may be necessary during construction activities. The documentation and sampling necessary for the groundwater treatment system depends on the type of treatment selected. Typically, sampling will include influent and effluent sampling to gauge system effectiveness and conformance to applicable permit discharge limits. If on-Site treatment of water generated during dewatering activities utilizing granular activated carbon is used, carbon change-out frequency will be determined by the manufacturer and performed and documented by the contractor to ensure adequate performance. The proposed sampling frequency and analysis will be presented to NYSDEC for concurrence prior to implementation.

8.3 Imported Fill Testing

8.3.1 General

Imported fill to be used as part of construction activities must be reviewed and approved for use by the project environmental engineer and NYSDEC. The source of the fill and the analytical data will be provided to the NYSDEC for review and approval prior to importing the fill to the Site using a Request to Import/Reuse Fill or Soil Form in Appendix C.

The sampling and analysis requirements for fill imported to the Site are set forth in 5.4(e)10 of DER-10, Technical Guidance for Site Investigation and Remediation (DER-10). Table 8.3-1 summarizes the frequency and analyses required based on total volumes.

Table 8.3-1 Recommended Number of Soil Samples for Soil Imported to the Site			
Contaminant	Volatile Organic Compounds	Semi-volatile Organic Compounds, PFAS, Inorganics & PCBs/Pesticides	
Imported Backfill Quantity in Cubic Yards	Discrete Samples	Composite Samples	Discrete Samples/Composites
0 – 50	1	1	3-5 Discrete samples from different locations in the fill being provided will compromise a composite sample for analysis
51 – 100	2	1	
101 – 200	3	1	
201 – 300	4	1	
301 – 400	4	2	
401 – 500	5	2	
501 – 800	6	2	
801 – 1,000	7	2	
> 1,000	Add an additional two volatile organic compound discrete samples and one composite sample for each additional 1,000 cubic yards or consult with NYSDEC		

8.3.2 Chemical Testing Waiver

Any material other than soil may be imported to the Site, without chemical testing, to be used as backfill beneath pavement, buildings or as part of the final site cover, provided that it contains less than 10% by weight material which would pass through a size 80 sieve and consists of: gravel, rock or stone, consisting of virgin material from a permitted mine or quarry. Documentation of these conditions still needs to be submitted to NYSDEC using the Request to Import/Reuse Fill or Soil Form in Appendix C and include a gradation analysis.

9.0 APPLICABLE PERMITS AND RELATED

9.1 Site Plan Approval

A Preliminary Conceptual Site Plan has been prepared and future redevelopment opportunities are under consideration. Detailed remedial plans will be included with the preliminary Site plans for approval to the City of Newburgh Planning Board. This RAWP is intended to be implemented concurrently with Site construction activity. The Applicant anticipates gaining Site plan approval in late 2023/early 2024.

9.2 Stormwater General Permit Coverage

A SWPPP will be presented to the City of Newburgh with the first Site Plan submission. The SWPPP, NOI and SWPPP Acceptance forms will be provided to NYSDEC DEC under separate cover after approval from the City of Newburgh, but prior to the start of construction.

9.3 Floodplain Development Permit

A small portion of the Site between the edge of jurisdictional wetlands on the northern portion of the Site and the 100-year floodplain boundary at the 234 feet elevation contour will require the placement of a one (1) foot soil surface cover system. Based on our understanding of Environmental Conservation Law, Article 36, Part 502 Floodplain Management Criteria for State Projects, a floodplain development permit would be necessary from the City of Newburgh when placing fill within a Federal Emergency Management Agency (FEMA) designated floodplain. A floodplain development permit will be applied for from the City of Newburgh prior to construction.

9.4 Impacted Water Related Permits

The permits related to the handling of impacted water generated from dewatering activities are summarized as follows:

- City of Newburgh Permit to Discharge Treated Water to Storm Sewer System
- Part 364 Permit for Haulers of Untreated Water to a Disposal Facility

- NYSDEC Short Term Discharge Permit

The actual permits needed will be determined after the selection of a particular or combination of handling and disposal methods.

9.5 Institutional and Temporary Engineering Controls

The remedy of the Site allows Commercial Use consistent with the contemplated use. Upon completion of the remedy, institutional and engineering controls (IC/EC) shall be required and a description of them will be incorporated into the Environmental Easement, as applicable.

10.0 SITE RESTORATION

10.1 General

The Site will be restored upon completion of remediation/redevelopment work in accordance with the Site development plans for commercial use of the Site. Preliminary Site plans are currently in progress. Detailed remedial Site plans will be included with the preliminary Site plans for approval to the City of Newburgh Planning Board. The future Site development plans will include grading plans and stormwater management plans, the details of which will be incorporated into the overall Site remedy.

10.2 Monitoring Well Abandonment

Several monitoring wells installed during the remedial investigation will likely be removed in their entirety during Site grading activities as a result of excavation activities. Monitoring wells not able to be excavated in its entirety shall be properly abandoned consistent with the procedures outlined in NYSDEC CP-43 Commissioner's Policy on Groundwater Monitoring Well Decommissioning.

To the extent possible and practical, at least one (1) upgradient well and four (4) downgradient wells will be left in place or replaced after construction to provide a mechanism for long-term groundwater monitoring efforts.

11.0 QUALITY ASSURANCE PROJECT PLAN

A quality assurance project plan (QAPP) is necessary to present the organizational structure and data quality objectives (DQOs) for the remediation, and the quality assurance (management system) and quality control methods to be implemented to ensure that the quantity and quality of the data required for its intended use is obtained and documented (i.e., that DQOs are met). The following sections outline the means and methods that will be used to obtain representative data of a known quality and sufficient quantity.

11.1 Project Organization

The Applicant has organized a team of professionals to undertake this project on their behalf. Below is a list of the main members of the team.

- Design Team: To Be Determined
- General Contractor: To Be Determined
- Remedial Engineer: C.T. Male
- Architect: To Be Determined

C.T. Male will be responsible for the overall administration and quality control/quality assurance of the remedial action implementation. These will include project management, engineering design, coordination and scheduling of activities in-house and with qualified subcontractors, and environmental construction observation. Data validation services will be performed by a subcontractor to C.T. Male, by a firm not involved with any other aspect of the project. The laboratory analytical testing, as applicable, will be subcontracted to a New York State Department of Health certified laboratory.

Key individuals for the remedial action and their associated title are presented below:

- Project Manager: James D. McIver, P.G.
- Project Environmental Engineer: Rosaura Andújar-McNeil, P.E.

- Senior Environmental Scientist: Eric White
- Office Health & Safety Officer: Nancy Garry, P.E.
- Site Health & Safety Officer: To Be Determined
- Field Geologists: Mary Loughlin
- Quality Assurance Officer: Jeffrey Marx, P.E.
- Data Validator: To Be Determined (Third Party)

11.2 Final Surface Cover Thickness Verification

The remedial action includes placement of a final surface cover (asphalt, concrete or vegetated soil) across the Site. The method to be employed for determining the required thicknesses are being achieved is as follows:

- A demarcation layer will be placed on top of the rough graded soil/waste materials, the surface of which will be surveyed by a New York State licensed land surveyor to establish the baseline for measuring and documenting the thickness of cover materials. The frequency of surface elevations shall be 30 feet by 30 feet grid, except within the footprint of the building. No demarcation layer will be placed in areas proposed for driveways, paved surfaces, parking, stormwater basins or building foundation.
- During the placement of the final surface cover, the thickness of the cover materials will be periodically measured by the environmental construction technician observing the work to document that the minimum thicknesses are achieved.
- The Contractor will be required to place the cover materials using their own surveying and grading control. Upon satisfactory placement of the final surface cover, the Contractor will be required to retain a New York State licensed land surveyor to survey the surface of the cover materials and certify that the required thickness of cover materials has been achieved. The frequency of surface

elevations shall be a 30 feet by 30 feet grid, and using similar locations to those prior to collection.

- The Contractor's NYS licensed land surveyor will be required to prepare a topographic map upon completion of work showing the elevation of the demarcation layer and elevation of final grades and prepare a certification that the thickness requirements of the cover materials has been achieved.

11.3 Post-Remediation Verification Sample Analytical Requirements

Post-remediation sampling would be performed for localized removal of a source of gross contaminated soil or hazardous waste. Post-remediation sampling for remaining areas (areas where localized removal is not performed) will not be conducted. Samples would be analyzed for TCL volatile and semi-volatile organic compounds by EPA Methods 8260 and 8270, pesticides/PCBs by EPA Methods 8081/8082, respectively, and TAL metals by EPA Method 6010/7470A, if required. The analytical results will require NYSDEC ASP Category B Data Deliverables.

The analytical results will be subjected to data validation. Data validation will be performed by a third-party validator, who will utilize the USEPA National and Regional Validation Guidelines/Procedures to determine the applicable qualifications of the data. The validator will then prepare DUSRs in accordance with NYSDEC guidance.

11.4 Quality Assurance/Quality Control for Sample Collection

11.4.1 Quality Assurance

The Quality Assurance (QA) objective for this project is to produce data which is technically valid and of a known quality that meets the needs of its intended use. The following paragraphs outline the procedures to be followed during sample collection.

Proper chain of custody will be established and maintained through a series of steps, beginning in the field and ending with final disposition of the analyzed sample. At the time of the field sampling, an external chain of custody form will be utilized to track sample collection until delivery to the analytical laboratory. An internal or "intra-

laboratory” chain of custody will be used by laboratory personnel to track the sample(s) from the point it is received/logged and passed through the laboratory process.

The analytical parameters, analysis methods, acceptable holding times and required method detection limits are presented in Table 11.4.4-1. The analytical methods specified reflect the requirements of the NYSDEC ASP.

Table 11.4.1-1 - Analytical Methods and Requirements

Analytical Parameters	EPA Method	Holding Times⁽¹⁾	Contract Required Quantitative Limits (as noted)⁽²⁾
TCL Volatile Organic Compounds (VOCs)	8260	Soil/Sediment: 7 Days to Analysis (cool to 4° C). Water: 5 Days Unpreserved to Analysis, 12 Days Preserved (HCl to pH<2) to Analysis.	10-100 ug/kg (Soil) 1 to 10 ug/l (Water)
TCL Semi-Volatile Organic Compounds	8270	5 Days to Extraction, 40 Days to Analyze	330 to 800 ug/kg (Soil) 10-25 ug/l (Water)
TCL Pesticides	8081	5 Days to Extraction, 40 Days to Analyze	1.7 to 170 ug/kg (Soil) 0.05-1 ug/l (Water)
TCL PCBs	8082	5 Days to Extraction, 40 Days to Analyze	33 to 67 ug/kg (Soil) 0.5-1 ug/l (Water)
TAL Metals	6010/7000 Series	180 Days except for Mercury (26 Days)	0.3 to 500 mg/kg (Soil) 3 to 5,000 ug/l (Water)
Per- and Polyfluoroalkyl Substances (PFOA and PFOS)	1633	28 Days to Extraction, 90 Days to Analyze	0.2 ng/g (Soil) 21.6 ng/l (Water)
Leachate Indicator Parameters ⁽³⁾	Variable	Varies depending on analysis	Varies depending on analysis

Note:

- 1) Holding times are relative to the verifiable time of sample receipt at the laboratory.
- 2) The listed method detection limits are practical quantitation limits (PQLs). The method detection limit (MDL) is the best possible detection. Laboratories report PQLs which are typically 4 times the MDL for liquids and varies for solids depending on the quantity of contamination present. Efforts will be made to obtain the lowest possible detection limit. When the guidance value or standard value is below the detection limit, achieving the detection limit will be considered acceptable for meeting that guidance or standard value.
- 3) As defined in NYCRR Part 360-2.11(d)(6), *Water Quality Analyses Tables*.

11.4.2 Quality Control Checks

To monitor and document the integrity of such factors as sample variability, sampling equipment cleanliness, sampling technique, analytical reproducibility and sample handling which can affect data quality, several field quality control checks will be implemented. These will include taking equipment/field blanks after the sampling equipment has been decontaminated to check for cross contamination and equipment cleanliness; taking duplicate samples to monitor analytical precision/reproducibility and sampling technique; and preparing transport blanks to be transported with the sample containers for volatile analyses to monitor sample handling. For this project the field Quality Control (QC) checks will consist of one (1) equipment/field blank, and one (1) duplicate sample, during each media sampling for every twenty (20) analytical samples. A transport blank will be prepared for each sample set of groundwater samples to be submitted for volatile analyses. Refer to Appendix A for C.T. Male Standard Operating Procedures, including QA/QC procedures for sampling.

Furthermore, if PFAS sampling is warranted, QA/QC samples for PFAS will be collected in accordance with “Sampling, Analysis, and Assessment of Per and Polyfluoroalkyl Substances (PFAS) Under NYSDEC’s Part 375 Remedial Programs” (dated April 2023) or subsequent modifications/guidance by NYSDEC.

Laboratory quality control checks will be those specified in USEPA Methods or in the NYSDEC ASP for the analytical method performed and could consist of some of the following:

- Blanks (method, preparation),
- Initial and continuing calibrations,
- Surrogate spikes,
- Matrix spikes/matrix spike duplicates,
- Duplicate samples, and
- Control samples/matrix spike blanks.

The laboratory will be responsible for complying with appropriate standards and certifications of the selected USEPA method and ASP requirements.

11.5 Sampling Protocols for Soils

The following Soil Sampling Protocols are anticipated to be implemented during the Limited Soil Investigation/Characterization, and during the collection of post-remediation verification soil samples after removal of unexpected grossly impacted sources or hazardous waste removal only.

During the Limited Soil Investigation/Characterization, at each sampling location, continuous soil sampling will be performed for purposes of screening and classifying soil. The subsurface soil samples will be collected using field decontaminated sampling barrel(s), sampling tools or excavator/backhoe bucket. The soils will be logged in accordance with ASTM D2488 (visual-manual method) and screened in the field for organic vapors with a photoionization detector (PID) and olfactory (sight and smell) evidence of contamination (i.e., subjective field evidence of contamination). The samples will be placed in laboratory provided sampling containers and the containers will be placed in a laboratory provided cooler containing ice. A chain of custody form will be completed, and the chain of custody form will accompany the samples to the laboratory. The following C.T. Male SOPs (Appendix A) will be followed by C.T. Male field personnel during drilling and collection of surface or subsurface soil samples.

- SOP - Note Taking and Field Logs.
- SOP - Drilling and Associated Sampling Methods.
- SOP - Organic Vapor Monitoring and Air Monitoring.
- SOP - Surface and Subsurface Soil Sampling.
- SOP - Equipment Decontamination Procedures.
- SOP - Chain of Custody Procedures.
- SOP - Domestic Transport of Samples to Laboratories in the USA.
- SOP - Collection of Quality Control Samples.
- SOP - NYSDEC DER April 2023 PFAS Sampling and Analysis Guidance.

Refer to Appendix A for C.T. Male Standard Operating Procedures, including QA/QC procedures for sampling.

11.6 Sampling Protocols for Groundwater

The following Groundwater Sampling Protocols are anticipated to be implemented following the implementation of the remedial action to document post-remediation conditions. If possible and practical, at least five (5) monitoring wells will be preserved for groundwater monitoring following remediation. At least one (1) upgradient well and four (4) downgradient wells will be left in place or replaced after construction to provide a mechanism for long-term groundwater monitoring. A final determination on these pre-existing wells or future new wells will be made in consultation with the NYSDEC Project Manager.

Prior to groundwater sampling, the wells will be purged employing low-stress pumping techniques utilizing pumps capable of achieving low-flow pumping rates with new factory supplied tubing for each well. Field parameter readings of pH, specific conductance and temperature will be recorded in 5-minute intervals from the start of purging using a multi-parameter water quality instrument. The water level and turbidity will be recorded at the same interval using separate meters. The wells will be sampled after three consecutive 5-minute readings whereby the parameters meet the criteria listed in USEPA low stress sampling guidance document. If the formation cannot support low-flow rates, the well will be purged dry, then groundwater within the wells will be allowed to recover to at least 80% of their initial static water level. Slow recharging wells will be allowed to recover for a period of up to four (4) hours before sampling. As a note, if it is assessed in the field that the monitoring wells may not recharge sufficient groundwater volume for sample collection, groundwater samples may be collected from pertinent monitoring wells that are not purged and/or partially purged.

The groundwater samples will be collected in order of decreasing volatility and constituents of concern beginning with VOCs, PFAS, and SVOCs followed by the remaining parameters to be analyzed. Field sampling personnel will wear a new pair of nitrile gloves at each monitoring well location. The samples will be placed in laboratory provided sampling containers and the containers will be placed in a laboratory provided cooler containing ice. A chain of custody form will be completed, and the chain of custody form will accompany the samples to the laboratory. The following C.T. Male SOPs

(Appendix A) will be followed by C.T. Male field personnel during collection of groundwater samples.

- SOP - Note Taking and Field Logs.
- SOP - Equipment Decontamination Procedures.
- SOP - Groundwater Sampling.
- SOP - Measuring Static Water Level, Immiscible Layers (DNAPL and LNAPL), and Total Well Depth in Water.
- SOP - Field Water Quality Measurements and Calibration.
- SOP - Chain of Custody Procedures.
- SOP - Domestic Transport of Samples to Laboratories in the USA.
- SOP - Collection of Quality Control Samples.
- SOP - NYSDEC DER April 2023 PFAS Sampling and Analysis Guidance.

Laboratory analyses will be determined upon the completion of the remedial action and will be determined in consultation with NYSDEC.

Refer to Appendix A for C.T. Male Standard Operating Procedures, including QA/QC procedures for sampling.

12.0 REPORTING AND CERTIFICATE OF COMPLETION

12.1 Final Report

Upon completion of remedial work, a Final Engineering Report (FER) will be prepared by the remedial engineer summarizing the work completed, any changes to the RAWP, the general findings and results of mitigation efforts, compliance with RAWP and a summary of any confirmation sampling efforts.

A Site Management Plan (SMP) will be prepared concurrently with the FER. The SMP will outline the procedures to manage remaining contamination at the Site. Furthermore, an Environmental Easement will be prepared by the legal counsel of the Applicant and recorded with the Orange County Clerk. The Environmental Easement will require compliance with the SMP and all the engineering and institutional controls placed on the Site. Compliance with the SMP is required until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36.

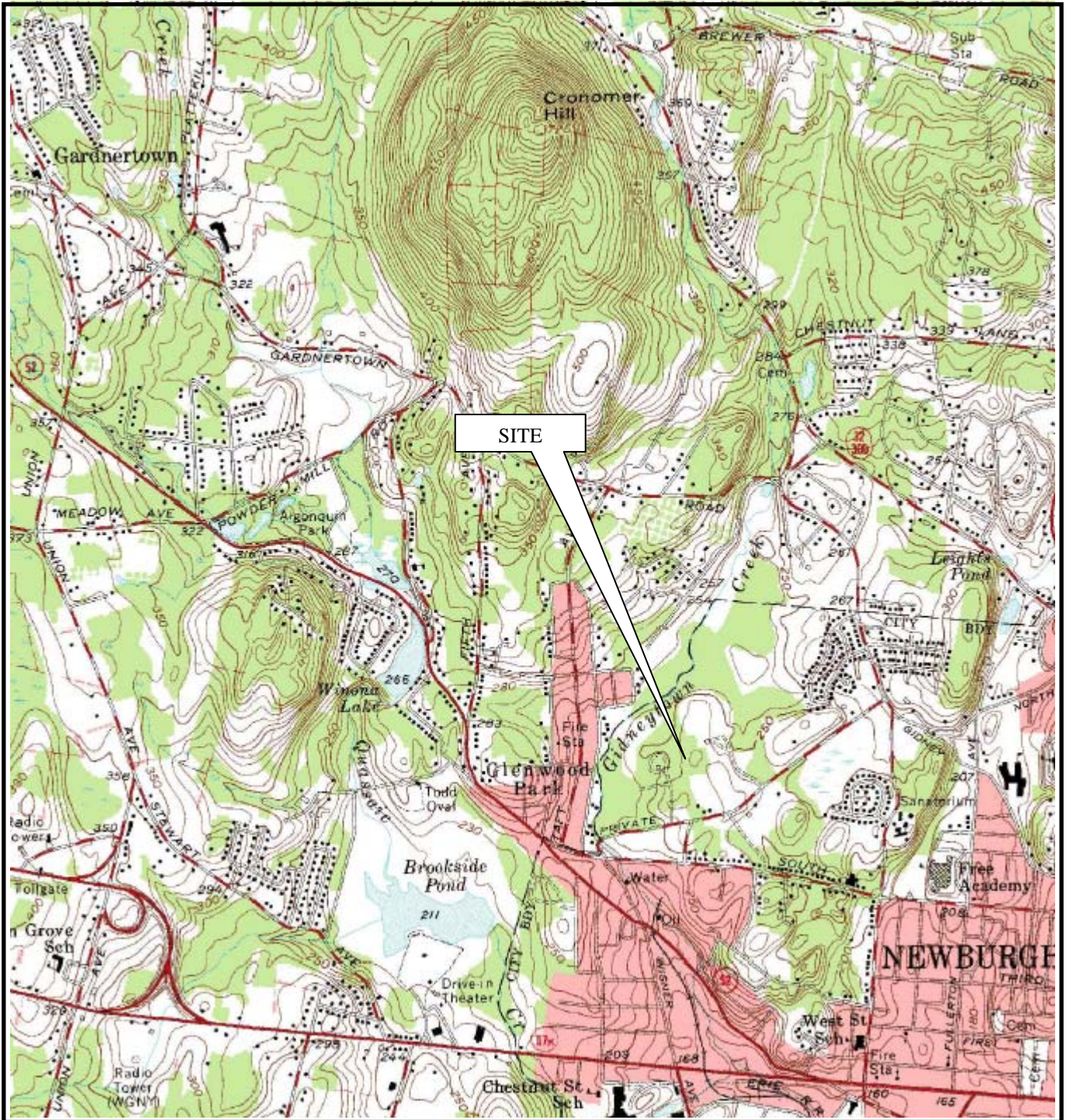
The FER and SMP will be prepared in accordance with the most recent templates prepared by NYSDEC. The FER and SMP will be certified by the project environmental engineer, who will be a registered professional engineer in NYS with appropriate remediation experience as identified in NYSDEC DER-10.

12.2 Certificate of Completion

The Applicant will be seeking a Certificate of Completion (COC) from NYSDEC upon completion the Site remediation work and approval of the FER. It is anticipated that the COC will be applied for after installation of foundations and building slabs but before the above grade construction begins. As such, completion of the Site remediation and receipt of the COC will likely be issued by NYSDEC prior to completion of building construction and all redevelopment activities.

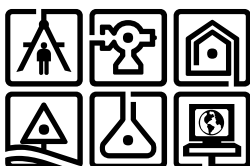
FIGURES

FIGURE 1
SITE LOCATION MAP



MAP REFERENCE

United States Geological Survey
7.5 Minute Series Topographic Map
Quadrangle: Newburgh, NY
Date: 1957



C.T. MALE ASSOCIATES

ENGINEERING, SURVEYING, ARCHITECTURE & LANDSCAPE ARCHITECTURE, P.C.

50 CENTURY HILL DRIVE
LATHAM, NY 12110

FIGURE 1 - SITE LOCATION MAP

CITY OF NEWBURGH

ORANGE COUNTY, NY

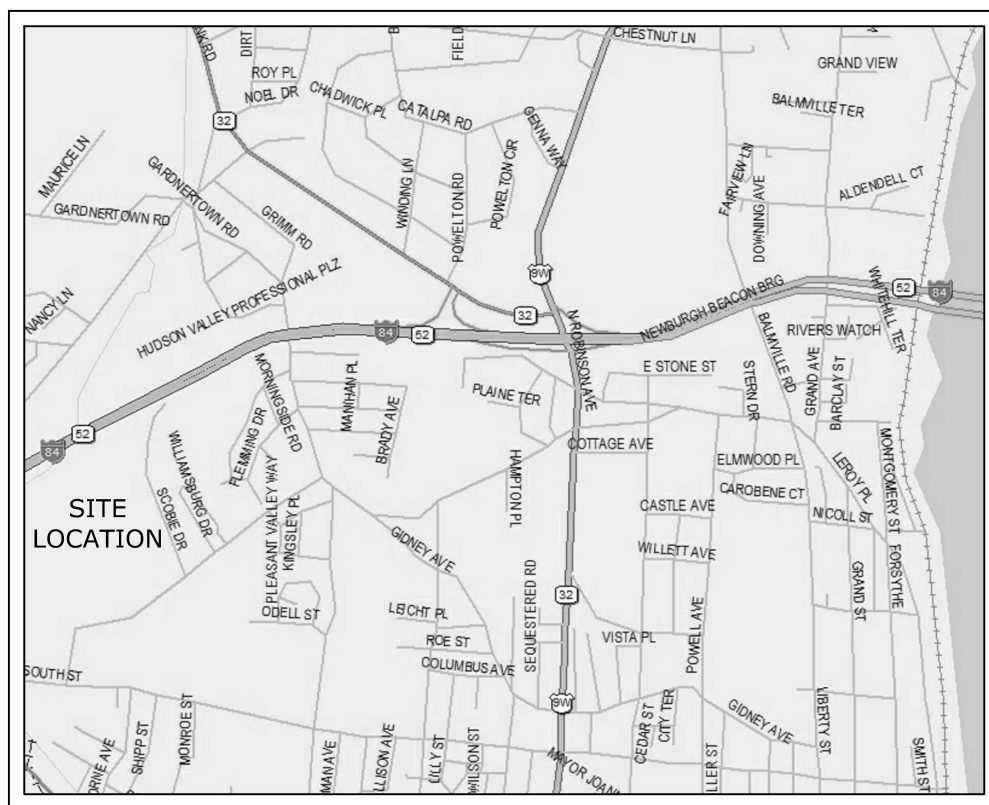
SCALE: 1:2,000±

DRAFTER: ASG

PROJECT No: 13.3061

The locations and features depicted on this map are approximate and do not represent an actual survey.

FIGURE 2
OPERABLE UNIT MAP



SITE LOCATION MAP
(NOT TO SCALE)

WETLANDS AND OTHER WATERS OF THE U.S.

WETLAND	ACREAGE	WETLAND TYPE
WETLAND 1	0.2± ACRE/8,600.66± SQ. FT.	PUBH
WETLAND 1A	0.23± ACRE/10,091± SQ. FT.	PEME/PSSIE

PUBH= Palustrine, unconsolidated bottom, permanently flooded
PEME= Palustrine, emergent, seasonally flooded/saturated
PSSIE= Palustrine, scrub-shrub, broad-leaved deciduous, seasonally flooded/saturated
Wetland type adapted from "Classification of Wetlands and Deepwater Habitats of the United States" Cowardin et al. 1979

MAP NOTES:

- Boundary and topographic information shown hereon was compiled from an actual field survey conducted during the month of May, 2014.
- North orientation and bearings are Grid North based on the New York State Plane Coordinate System, East Zone, NAD 83. As established by GPS observations.
- Objects shown on this drawing with a distance indicating how far that object is from a particular line, lie on the same side of the line that the offset distance is written.
- Vertical datum shown hereon is NAVD 88 and was obtained through GPS observations.
- Underground facilities, structures, and utilities have been plotted from data obtained from previous maps and record drawings. Surface features such as catch basin rims, manhole covers, water valves, gas valves, etc. are the result of field survey unless noted otherwise. There may be other underground utilities, the existence of which is not known to the undersigned. Size and location of all underground utilities and structures must be verified by the appropriate authorities. Dig Safe New York must be notified prior to conducting test borings, excavation and construction.
- This survey was prepared without the benefit of an up to date abstract of title or title report and is therefore subject to any easements, covenants, restrictions or any statement of fact that such documents may disclose.
- Wetlands and other waters of the U.S. were delineated by a C.T. Male field representative October 3, 2013 and May 9, 2014 in accordance with the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual and Northeast and North Central Regional Supplement.
- The waters of the U.S. acreage has been calculated within the limits of delineation.
- Soil Boring SB-13 was located in the field by the use of a hand held GPS Unit and not the result of conventional survey methods.

MAP REFERENCES:

- New York State Department of Transportation Appropriation Map No. 3-C Parcel 1213, "Interstate Route 503-1-7.2, Thruway to Existing Route 9W, S.H. No. 62-4", Dated January 20, 1984 on file in the Office of The New York State D.O.T. Region No. 8.
- "Sketch Plan Survey and Subdivision of Lands For Sertro Realty Corp." City of Newburgh, Orange County, New York, prepared by Roger J. Ferris Engineering and Land Surveying, P.C. dated January 24, 1989 and last revised March 29, 1989, filed in the Orange County Clerk's Office on April 14, 1989 as Map No. 9436.
- "Subdivision of Lands for City of Newburgh Industrial Development Agency" City of Newburgh, Orange County, New York, prepared by Roger J. Ferris Engineering and Land Surveying, P.C. dated August 26, 1994 and last revised September 8, 1994, filed in the Orange County Clerk's Office on December 7, 1994 as Map No. 210-94.

TOTAL AREA=8,600.66± SQ. FT. OR 0.2± ACRE

NO PLANNED SITE DEVELOPMENT

WETLAND AREA

OPERABLE UNIT NO. 1

DPW PROPERTY

LEGEND

CBS	CATCH BASIN SQUARE
ES	DRAINAGE END SECTION
DPH	DRAINAGE MANHOLE
GR	GRANITE MONUMENT
HH	HAND HOLE
HVD	HYDRANT
IP	IRON PIPE FOUND
IR	IRON ROD FOUND
LP	LIGHT POLE
HW	MONITORING WELL
PZ	PIEZOMETER
SMH	SANITARY MANHOLE
SB-1	SOIL BORING
TMH	TELEPHONE MANHOLE
TPED	TELEPHONE PEDESTAL
TRANS	TRANSFORMER
TCUR	TOP & BOTTOM CURBS ELEVATION
UPED	UNKNOWN PEDESTAL
UV	UNKNOWN VALVE
WV	WATER VALVE
WFL	WETLAND FLAG
GR	GUARD RAIL
US	UNDERGROUND SANITARY SEWER LINE
ST	UNDERGROUND STORM LINE
UT	UNDERGROUND TELEPHONE LINE
UTV	UNDERGROUND TELEVISION LINE
FL	100 YEAR FLOOD PLAIN BOUNDARY



PROGRESS PRINT

FIGURE 2
OPERABLE UNIT NO. 1

5 SCOBIE DRIVE

CITY OF NEWBURGH	ORANGE COUNTY, NEW YORK
C.T. MALE ASSOCIATES Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C. 50 CENTURY HILL DRIVE, LATHAM, NY 12110 PH 518.786.7400 COLRUSKILL, NY • GLENS FALLS, NY • ROUGHERSPE, NY JOHNSTOWN, NY • RED HOOK, NY • SYRACUSE, NY	FIG-2 SHEET 01 OF 01 DWG. NO: 22-0301

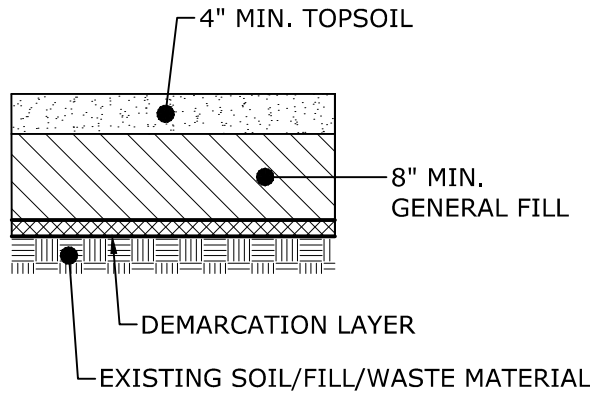
DATE	REVISIONS RECORD/DESCRIPTION	DRAFTER	CHECK	APPR.

© 2022
C.T. MALE ASSOCIATES
DESIGNED: A.MALAMET
DRAFTED: S.WUNSCH
CHECKED: A.MALAMET
PROJ. NO.: 19.9405
SCALE: 1"=40'
DATE: APRIL, 2022

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF THE NEW YORK STATE EROSION LAW.

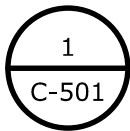
FIGURE 3
SURFACE COVER DETAILS

UNAUTHORIZED ALTERATION OR ADDITION TO THIS DOCUMENT IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW.



NOTE:

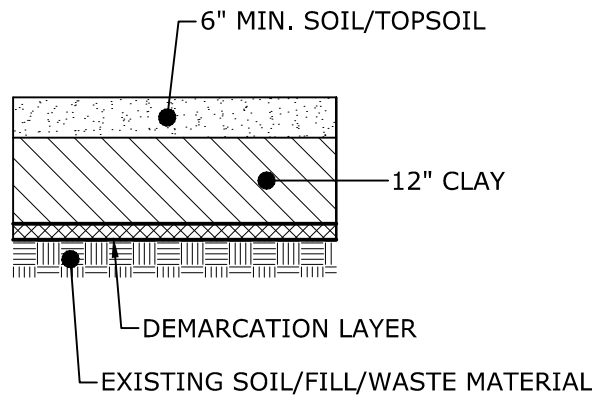
1. THE ENTIRE SCS SHALL BE IN ACCORDANCE WITH THE REMEDIAL ACTION WORK PLAN AND BROWNFIELD CLEANUP PROGRAM.



SURFACE COVER SYSTEM - GENERAL

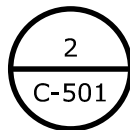
SCALE: NONE

CROSS REFERENCE: NONE



NOTE:

1. THE ENTIRE SCS SHALL BE IN ACCORDANCE WITH THE REMEDIAL ACTION WORK PLAN AND BROWNFIELD CLEANUP PROGRAM.




SURFACE COVER SYSTEM STORMWATER BASIN

SCALE: NONE

CROSS REFERENCE: NONE

C-501

Date	RECORD OF WORK	Appr.	SURFACE COVER DETAILS	
			CITY OF NEWBURGH	ORANGE COUNTY, NEW YORK
			C.T. MALE ASSOCIATES Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C. 50 CENTURY HILL DRIVE, LATHAM, NY 12110 PH 518.786.7400 COBLESKILL, NY • GLENS FALLS, NY • POUGHKEEPSIE, NY JOHNSTOWN, NY • RED HOOK, NY • SYRACUSE, NY  www.ctmale.com	
Drafter: S.WUNSCH		Checker: J.MARX		
Appr. by: J.MARX		Proj. No. 19.9405	SCALE: NONE	DATE: MARCH 30, 2022

APPENDICES

APPENDIX A
C.T. MALE STANDARD OPERATING PROCEDURES



C.T. MALE ASSOCIATES ENGINEERING,
SURVEYING, ARCHITECTURE,
LANDSCAPE ARCHITECTURE &
GEOLOGY, D.P.C

STANDARD OPERATING PROCEDURE

CHAIN OF CUSTODY PROCEDURES

March 6, 2020

Print Technical Reviewer Signature Date

Print QA Manager Signature Date

Review of the SOP has been preformed and the SOP still reflects the current practice			
Initials		Date	
Initials		Date	

SOP: CHAIN OF CUSTODY PROCEDURES

1.0 PURPOSE

The purpose of this procedure is to describe how to properly document information on a Chain-of- Custody (COC) form. A COC is a legally binding document that identifies sample identification, analyses required, and shows traceable possession of samples from the time they are obtained until they are introduced as evidence in legal proceedings. CT Male Associates (CT Male) personnel will complete the information on the COC at the time he/she collects samples and the COC accompanies the samples during transport to a storage facility or to the laboratory for analysis.

The recommended procedures in this SOP should be followed unless conditions make it impractical or inappropriate to do so. Modifications should be noted in the applicable documentation and communicated to appropriate personnel.

2.0 SCOPE

This procedure applies to all C.T. Male personnel engaged in the collection of samples from several Site media (water, soil, etc.) for laboratory analysis per an accepted New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) or Environmental Protection Agency (EPA) laboratory method.

3.0 GENERAL

As part of this SOP, there are limitations on the COC procedures, and they are as follows:

- The SOP does not apply to sample aliquots that are only collected for field screening purposes.
- The SOP does not apply to samples remaining on-site.

4.0 RESPONSIBILITIES

4.1 Project Manager

Field sampling personnel, in conjunction with the Project Manager are responsible for overall compliance with this technical procedure. The Project Manager, or designee, is responsible for verifying that the data entries made on the COC comply with this SOP.

The Project Manager will also provide copies of COC to the Quality Assurance Officer for general review.

4.2 Site Personnel

Experienced Field Personnel are responsible for the proper sample identification and for accurate and complete documentation on the COC. Site personnel who make COC entries are required to read this procedure before engaging in this activity. The Project Manager, or designee, will inform personnel who will be responsible for COC procedures.

5.0 PROCEDURE

The COC is the most important sampling document; it must be filled out accurately and completely every time a sample is collected. The COC will be supplied by the laboratory that will be performing the analytical analysis on the environmental media (soil, water, drinking water, sediment, etc). Depending on the laboratory, the COC may be available in electronic format that will allow for certain fields on the COC to be filled out ahead of time (e.g., project number, project name, project manager, purchase order number, data validation package, turnaround time, etc.) while other information should be completed when sampling. Complete one COC or more as needed for each set of project samples. The COC should be completed prior to leaving the sampling location.

The laboratory receiving the samples will sign and record when received, the lab work order number, and whether any custody seals were used and if intact.

5.1 Common Chain of Custody Information

Listed below are common fields or information that is listed on the COC, which may or may not be applicable to the sampling media or analytical analysis:

- COC numbered pages (e.g., 1 of 1).
- Report and invoice recipient information.
- Purchase order number or account number (if applicable).
- Project name and number.
- Project Manager name.
- Field Technician (sampler) name.
- Sample Identification (Sample ID).

- Analysis requested.
- Sample collection date and time.
- Sample matrix (COC may have abbreviation codes).
- Sample type – composite or grab.
- Sample Preservation Code or written name.
- Sample filtration (if needed).
- Sample Comments, if any.
- Laboratory name and location.
- Requested due date.
- Turnaround time for analysis.
- Method of analytical delivery – email, hard copy – and to whom.
- Data deliverable information.
- An EDD (electronic data deliverable) format.
- Signature of Field Technician (i.e. sampler) under the first ‘relinquished by’.
- Date and time of sample transfers.
- Method of transport (UPS, FedEx, local courier, sampler, etc.).
- Air Bill number (if applicable).

For Air Sampling in SUMMA Canisters, the laboratory may supply a different type of COC that is specific for the collection of air samples. These labs supplied COC typically have different fields that need to be completed, in addition to the ones listed above that area applicable. These fields include, but are not limited to:

- Canister serial number and size or lab identifier.
- Flow controller serial number or lab identifier.
- Initial and final vacuum.
- Stop and start time of air flow.
- PID reading.

5.2 Completing a Chain of Custody Information

The sample collector is responsible for the care and custody of the samples until they are properly transferred or sent to the laboratory. This means that samples are in their possession, under constant observation, or secured. Samples may be secured in a sealed container, locked vehicle, locked room, etc.

All samples leaving the site should be accompanied by a COC record. This record documents sample custody transfer from the sampler, often through another person, to the laboratory. The individuals relinquishing the samples should sign and date the record.

Shipping containers should be sealed and include a tamper indicating seal that will indicate if the container seal has been disturbed. The method of shipment, courier name, or other pertinent information should be listed in the COC record.

The original COC record should accompany the samples. A copy of the record should be retained by the individual or organization relinquishing the samples. Page one (white copy) accompanies the sample shipment to the laboratory; page two (yellow copy) is the Field Technician's copy; and page three (pink copy) is retained by CT Male for filing. In some instances, the yellow copy goes to the lab and the pink copy is retained by the Field Technician. The transmittal of the copies of the COC will be designated by the laboratory providing the analytical service.

The individual receiving the samples should sign and date the record. The condition of the container and the tamper indicating seal should be noted on the COC record. Any problems with the individual samples, such as a broken container, should be noted on the record.

Instructions on how to complete a COC are provided by the laboratory. The CT Male Project Manager will ensure that the field personnel are experienced and have the knowledge to complete the COC prior to sampling activities.

7.0 Document Control - Records

The Field Technicians copy of the COC will be kept in the project files and scanned to C.T. Male Associate's electronic project directory. The Project Manager will be responsible for ensuring that the COC record received by the laboratory is signed and dated by the lab as the receiver of the COC and samples, and note any issues with the samples upon receipt.



C.T. MALE ASSOCIATES ENGINEERING,
SURVEYING, ARCHITECTURE,
LANDSCAPE ARCHITECTURE &
GEOLOGY, D.P.C

STANDARD OPERATING PROCEDURE

COLLECTION OF GROUNDWATER SAMPLES USING LOW-FLOW PURGING AND SAMPLING

March 6, 2020

Print Technical Reviewer Signature Date

Print QA Manager Signature Date

Review of the SOP has been preformed and the SOP still reflects the current practice			
Initials		Date	
Initials		Date	

SOP: COLLECTION OF GROUNDWATER SAMPLES USING LOW-FLOW PURGING AND SAMPLING

1.0 PURPOSE

The purpose of this procedure is to describe the methods used for low-flow purging and sampling of monitoring wells. Low-flow sampling maximizes the potential for representative groundwater samples. A representative groundwater sample should accurately reflect the physical and chemical properties of the groundwater in the portion of the formation open to the well. This SOP also provides details regarding the measurement of groundwater stabilization criteria, and identification of common container, preservative, and holding times for typical groundwater sample analyses.

2.0 SCOPE

This SOP applies to all C.T. Male Associates personnel and subcontractors engaged in sampling of groundwater monitoring wells and piezometers. This SOP focuses on low flow sampling techniques and should be used in conjunction with other applicable project SOPs, including the following:

- SOP: Note Taking and Field Logs.
- SOP: Organic Vapor Monitoring and Air Monitoring.
- SOP: Equipment Decontamination Procedures.
- SOP: Groundwater Sampling Procedures.
- SOP: Measuring Water Levels, Immiscible layers, total well depth.
- SOP: Chain of Custody Procedures.
- SOP: Domestic Transport of Samples to Laboratory.

3.0 LIMITATIONS

The limitations of this SOP are as follows:

- Sample collection methods can vary by project. If not specified in the project scope of work and/or documentation (e.g., Work Plan, Field Sampling Plan (FSP), or Quality Assurance Project Plan (QAPP)), consult with the appropriate regulatory agency for guidance.
- Minimum of 24 hours will pass between monitoring well development and monitoring well sampling.

- It is recommended that low-flow sampling be conducted when the air temperature is above 32 °F (0 °C). If the procedure is used below 32 °F, special precautions will need to be taken to prevent the groundwater from freezing in the equipment. Ice formation in the flow-through-cell will cause the monitoring probes to act erratically. A transparent flow-through-cell should be used to observe if ice is forming in the cell.
- Direct sun light and hot ambient air temperatures may cause the groundwater in the tubing and flow-through-cell to heat up. This may cause the groundwater to degas which will result in loss of volatile organic compounds (VOCs) and dissolved gases. When sampling under these conditions, the sampler will need to shade the equipment from the sunlight (e.g., umbrella, tent, etc.). The tubing exiting the monitoring well should be kept as short as possible to avoid the sun light or ambient air from heating up the groundwater.
- Collection of groundwater samples from residential/ water supply systems are not discussed within this SOP.
- Dedicated sampling equipment and/or decontamination of sampling equipment is required to prevent cross-contamination.

4.0 RESPONSIBILITIES

4.1 Project Manager

The Project Manager will develop the site specific scope of work based upon the needs of the project. These work plans can include a site specific work plan, Health and Safety plan, community air monitoring plan, field sampling plan, and a QAPP.

4.2 Field Team Leader

The Field Team Leader will develop site specific or direct the low flow sampling procedures to be used and direct field technicians in the proper procedures in the SOPs. The Field Team Leader should know the requirements for low flow sampling and should maintain adequate documentation of the sampling process.

4.3 Field Technician

Experienced Field Technician(s) are responsible for the measurement of well pumping rates, field screening procedures, field equipment and calibration, proper sample

identification, collection of samples, quality control procedures, and documentation. They should be familiar with the procedures described in this document and use professional judgment when sampling, especially when conditions are not routine, in order to collect a representative sample.

4.4 Health & Safety Officer

The Health & Safety Officer oversees site-specific health, safety, and environment (HS&E) protocols and overall compliance with project HS&E requirements. The Health and Safety Officer conducts personal protective equipment (PPE) evaluations, selects the appropriate PPE, lists the requirements in the Project-specific Health and Safety Plan (HASP), coordinates with the Project Manager and Field Manager to certify the PPE, and conducts project health and safety audits to evaluate the effectiveness of the HS&E program.

4.5 Site Safety and Health Officer

The role of Site Safety and Health Officer is delegated to the Field Team Leader by the Project Manager to assist in implementing the project HASP. The Project Manager and/or Health & Safety Officer assists the Field Team Leader with the health and safety program, implements the PPE requirements described in the project HASP and receives input from project staff that the assigned PPE requirements and on-going HS&E procedures are effective.

5.0 EQUIPMENT, REAGENTS, and SUPPLIES

The following items are applicable to this SOP:

- Water quality meter (e.g., YSI or equivalent)
- Turbidimeter
- Water level indicator
- Graduated measuring container
- Clock or stopwatch
- Inline filters (if applicable)
- Sample containers (method specific)
- Sample labels
- Coolers

- Pumps (e.g., submersible, bladder or peristaltic), power source and appropriate drive tubing
- Compressed air source (bladder pump only)
- Ring Stand or equivalent to secure tubing
- Sample tubing**
- Calculator
- Plastic Bags
- Waterproof ink pen or pencil
- Ice

** Tubing constructed of Teflon or Teflon-lined polyethylene tubing are preferred when sampling includes VOCs, SVOCs, pesticides, PCBs, and inorganics but other materials may be used if information is available showing that there is no leaching of contaminants or interferences for the analyses being performed. PVC, polypropylene or polyethylene tubing may be used when collecting samples for metals and other inorganics.

6.0 PROCEDURE

This section addresses the procedure(s) for calibrating field equipment, measuring pumping rates, well purging, measuring well stabilization, and the sampling, handling, and delivery involving groundwater sampling. Best practices include setting up the purging, stabilization, and sampling equipment in an upwind direction from any potential source of contamination.

6.1 Calibration

The water quality meter and turbidimeter will be calibrated as per the applicable CT Male SOP. The meters will undergo calibration checks, at a minimum, before and after sampling. The calibration check will be documented on a calibration form (as appropriate) and/or in the field notebook. Any significant issues found during the calibration check will be noted in the field notebook.

6.2 Purging/Well Stabilization/Sampling

Prior to sampling, water levels are measured (see applicable CT Male SOP) and purging of the monitoring well is performed to remove stagnant water from within the well and to stabilize the well to allow for representative groundwater sample collection. The term 'purge volume' refers to the amount of water removed from a well before groundwater sample collection occurs.

Low-flow purging may be completed using one of the following, depending on the well and the sampling requirements; an electric submersible pump, bladder pump, or peristaltic pump. Pumps constructed of stainless steel or Teflon are preferred but other materials may be used if information is available showing that there is no leaching of contaminants or interferences for the analyses being performed. Dedicated equipment should be installed when possible to minimize disturbance in the well. Non-dedicated (portable) sampling devices will be slowly and carefully lowered into the well to minimize disturbance. The intake port for the pump being used will be placed at a depth such that the intake is at or slightly above the middle of the screened interval.

Pumping rates during low-flow purging are typically kept below 500 mL/min; however, this is dependent on the site-specific hydrogeology and will be adjusted to minimize drawdown during purging. Drawdown is the lowering of the water level in a monitoring well due to water being evacuated (purged) faster than the groundwater recharge rate. An electronic water level indicator will be used to determine that a minimal amount of drawdown is occurring within the well, ideally, no more than 4 inches. Flow rate will be measured using a graduated measuring container and a watch/clock. During the first purge/sampling event, a purge rate will be established for each monitoring well. Samplers should attempt to match the same purge rate during subsequent events, if possible. Pump powering equipment that generates air emissions will be kept downwind of the well that is being sampled.

If the well was purged dry, the samples should be collected within 24 hours of when the well was purged dry or when sufficient recharge allows (e.g., enough volume for analyses). If there is insufficient sample volume for the analyses being sampled, the project team will need to decide if sampling should be carried out or if a reduced prioritized list of analyses should be collected.

6.2.1 Peristaltic Pump Purging

A peristaltic pump is used when the water level is within suction lift (e.g., within about 25 feet of the ground surface but may be less at higher altitudes). It usually is a low-volume suction pump with low pumping rates suitable for sampling shallow, small-diameter wells.

- Put on gloves for skin protection and to prevent sample contamination.
- Lower tubing intake into the well and secure at desired depth (typically, middle of the well screen interval).
- Connect the well tubing to the drive tubing entering the pump.
- Connect the drive tubing exiting the pump to the short section of tubing entering the flow- through cell or graduated measuring container.
- Set the pump speed to zero. Turn on pump and slowly increase the speed to the desired rate of flow.
- Attach the flow-through-cell for the water quality meter after initial turbidity in the purge water has cleared visually.
- Sampling may begin once the well has stabilized (see Section 6.2.4, Well Stabilization of this SOP).

Note: Due to the negative pressure used to lift the sample when using a peristaltic pump, loss of some VOCs could occur, especially at depths to groundwater approaching suction lift limitations (>20 feet). The project team should decide if VOCs should be collected from a peristaltic pump based on their project requirements.

6.2.2 1.5-inch Submersible Pump Purging (Temporary or Dedicated)

A submersible pump is used when the water level is greater than the suction lift associated with a peristaltic pump. It can purge water from depths down to 200 feet depending on pump model and manufacturer. A variable speed controller is required for operation of the pump. There are a variety of speed controllers available, typically designed for a specific pump.

- Put on gloves for skin protection and to prevent sample contamination.
- Attach appropriate diameter tubing to pump intake, lower pump, and secure at desired depth (typically, middle of the well screen interval).
- Cut off tubing, allowing additional tubing length for discharge.
- Set the controller speed or voltage to zero.
- Plug the pump into the controller.
- Attach the controller to the power supply.

- Turn on the controller and dial the speed control to the desired flow rate, and measure the flow rate with the graduated measuring container. The controller can slow the purge rate down to the optimum rate.

Note: If the submersible pump is not running, turn off the pump and then disconnect from the power supply. Check connections and try again.

- Attach the flow-through-cell for the water quality meter after initial turbidity in the purge water has cleared visually.
- Sampling may begin once the well has stabilized (see Section 6.2.4, Well Stabilization of this SOP).

6.2.3 Bladder Pump Purging

A bladder pump may be used when the static water level is > 25 feet or at shallower depths when concerns with VOC loss via peristaltic pumping is identified by the project team.

- Put on gloves for skin protection and to prevent sample contamination.
- Hook air and sampling tubing to the pump.
- Lower pump into the well at the desired depth (typically, middle of the well screen interval).
- Attach the air side of the tubing to the controller.
- Attach controller to the air source (e.g., air compressor or compressed CO₂).
- Set the air pressure to the manufacturer's recommendation based on the well depth.
- Set the number of pumping cycles, recovery times, and discharge times.
- When water flows from discharge of the pump, adjust the flow according to desired flow rate and measure the flow rate with the graduated measuring container.
- Attach the flow-through-cell for the water quality meter after initial turbidity in the purge water has cleared visually.
- Sampling may begin once the well has stabilized (see Section 6.2.4, Well Stabilization of this SOP).

6.2.4 Well Stabilization

Well stabilization is typically conducted to help verify that the groundwater sample is representative of aquifer conditions. A well is considered 'stabilized' after the

groundwater (or well) stabilization parameter measurements are within acceptable limits for three consecutive readings. The stabilization parameters should be monitored at a frequency of three to five-minute intervals or greater unless there are other project requirements. The pump's flow rate must be able to 'turn over' at least one flow-through cell volume between measurements (e.g., flow rate = 50 mL/min, flow-through cell = 250 mL, monitor every five minutes; every 10 minutes with a 500 mL flow-through cell). Well stabilization parameters may vary by project or regulatory agency but at a minimum typically include pH, conductivity (temperature corrected electrical conductivity), oxidation-reduction potential (ORP), turbidity, and dissolved oxygen (DO). Temperature should also be measured and recorded but will not be used to determine stability. Turbidity and DO usually require the longest time for stabilization.

Most wells should stabilize within two hours. Prior to going on-site, review previous low-flow groundwater sampling logs from the site (if available) and discuss with the project or task manager what should be done if wells take longer than two hours to stabilize (e.g., collect a pair of filtered/unfiltered samples for metals analysis when turbidity > 5 NTU). Initially, the field technician should verify that the field equipment is functioning properly and that operator error is not an issue. If the checks produce no new insight, one of three optional courses of action may be taken: 1) continue purging until stabilization is achieved, 2) discontinue purging, do not collect any samples, and record in the field log data sheets or field notebook and in the Field Sampling Report that stabilization could not be achieved (documentation must describe attempts to achieve stabilization), or 3) discontinue purging, collect samples and clearly document in the field log data sheets or field notebook and in the Field Sampling Report that stabilization was not achieved.

The procedure to stabilize a well includes recording well stabilization parameter measurements collected with the water quality meter during the well purging process and recording the purged well volumes. Groundwater aliquots used for stabilization parameter measurements (aside from turbidity) are measured by utilizing in-line, flow-through cell equipment. Turbidity is typically measured with a standalone turbidimeter by collecting samples from a three way valve installed upstream of the flow-through-cell.

Documentation of the well stabilization process typically includes recording pertinent information such as the pump type, pumping rate, volume pumped, and well stabilization measurements on the field log data sheets or field notebook.

The well may be sampled after three consecutive measurements are within specific project criteria or the criteria presented in Section 7.2, Measurement Criteria of this SOP.

6.2.5 Sampling

After the well has been purged and stabilized, disconnect the tubing exiting the pump from the flow-through cell. The same pump that is used for purging will be used for low-flow sampling. The project team will determine the order for sampling the wells but general guidelines are below:

- Where water quality data are available, the least contaminated wells would be sampled first, proceeding to increasingly contaminated wells.
- Where the distribution of contaminants is not known, wells considered to be upgradient from likely sources of contamination would be sampled first and downgradient wells closest to the suspected contamination would be last.
- Make certain to keep records of the order in which wells were sampled.

To prevent the possible loss of some volatile organic compounds (VOCs), samples for volatile parameters should be collected first with as little agitation and disturbance as possible, then proceed in order towards the least volatile parameter. The 40 mL vials used to collect the VOC samples should be checked for air bubbles. Air bubbles may be caused by insufficient meniscus when sealing the vial, degassing after sample collection or during sample shipment, or reaction between the sample and preservative (HCl). If air bubbles > 6 mm (pea-sized) are observed during sampling, discard the vial and recollect the sample using a new vial. If air bubbles are believed to be due to the sample reacting with the preservative, the sample should be collected in an unpreserved vial if possible.

Depending on project requirements, groundwater samples being analyzed for metals may or may not be filtered and in some cases, both filtered and unfiltered samples may be collected. Inline filtration methods will be used to collect filtered samples.

Put on new sampling gloves at each sampling site to reduce the risk of sample cross-contamination and exposure to skin. Never reuse old gloves.

Prepare sampling containers by filling out the label, using an indelible permanent pen, with the following information at a minimum:

- Sample ID
- Date and time of sample collection
- Preservative
- Sample analysis (if required by the lab)

When filling the containers, do not insert the tubing into the containers and do not overfill preserved containers. When all samples are containerized, place the filled sample containers in a sampling cooler with ice, turn off any equipment, disassemble the sampling apparatus, carefully remove non-dedicated equipment to minimize disturbance to the well, dispose of all one-time use (disposable) equipment, and decontaminate reusable equipment per CT Male's SOP 'Equipment Decontamination Procedures'.

6.2.6 Preservation

Container volume, type, and preservative are important considerations in sample collection. Container volume must be adequate to meet laboratory requirements for quality control, split samples, or repeat analyses. The container type varies with the analysis required. Typically, the analytical laboratory will preserve the container before shipment. Preservation and shelf life vary; contact the laboratory to determine if an on-hand container is still useful.

6.2.7 Handling

The samples will be bubble wrapped or bagged after collection, stored in a sample cooler, and packed on double bagged wet ice. Samples will be kept cold ($\leq 6^{\circ}\text{C}$, but not frozen), until receipt at the laboratory (where applicable).

Note: Samples may need to be stored indoors in winter to prevent freezing.

6.2.8 Shipment/Delivery

Once the cooler is packed to prevent breaking of bottles, the proper chain-of-custody (COC) documentation is signed and placed inside a plastic bag then added to the cooler. The COC will be completed in accordance with CT Male's SOP, 'Chain of Custody Procedure'. All samples will be kept secured to prevent tampering. If sample coolers are left in a vehicle or field office for temporary storage, the area will be locked and secured. Custody seals may be present, but at a minimum, the coolers must be taped shut to prevent the lid from opening during shipment.

The coolers must be delivered to the laboratory via hand or overnight delivery courier, if possible, in accordance with all Federal, State and Local transportation regulations and CT Male's SOP 'Domestic Transport of Samples to the Laboratory'.

6.3 Data Reduction/Calculations

No data reduction or calculations are associated with this procedure.

6.4 Disposal

Waste generated by this process will be disposed of in accordance with Federal, State and Local regulations and CT Male's SOP 'Investigative Derived Waste'. Where reasonably feasible, technological changes have been implemented to minimize the potential for environmental pollution.

7.0 QUALITY CONTROL and QUALITY ASSURANCE (QA/QC)

The QC activities described below allow the self-verification of the quality and consistency of the work.

7.1 QA/QC Samples

QA/QC samples are defined in CT Male's SOP 'Collection of Quality Control Samples'. The sampling frequency should be performed at the frequency noted in the project scope of work and/or documentation (e.g., Work Plan, FSP, or QAPP).

7.2 Well Stabilization Criteria

Well stabilization criteria to be used if there are no project specific criteria:

- pH \pm 0.1 standard units
- Conductivity - \pm 3%
- ORP \pm 10 mV
- Dissolved oxygen \pm 10% (> 0.5 mg/L)
Note: Three consecutive readings ≤ 0.5 mg/L can be considered stabilized.
- Turbidity \pm 10% (> 5 Nephelometric Turbidity Units (NTU))
Note: Three consecutive readings ≤ 5 NTU can be considered stabilized.

8.0 RECORDS

The field technician will document the flow rate, drawdown, time purged, volume purged, water level, total well depth, stabilization test measurements, and any unusual conditions that occurred (e.g., excessive drawdown, noticeable discoloration, presence of sediment, odor in the water, etc.) on the field log data sheet and/or field notebook. They will also document the type and number of bottles on the chain-of-custody record, as appropriate. The analysis for each container and the laboratory used will be documented on the chain-of-custody record. Refer to CT Male's SOP 'Documentation on a Chain-of-Custody (COC)' for further information.

Examples of common field documentation are available in CT Male's, "Note Taking and Field Logs". Field documentation specific to this SOP are listed below:

- Sample Label
- Chain-of-custody (COC)
- Custody Seal (if applicable)
- Water Level Data Sheet
- Field Log Data Sheet

The field documents and COCs are provided to the Field Team Supervisor and into the electronic file folder for the project. Other CT Male SOP subjects referenced within this SOP: field water quality measurements, chain of custody procedures, equipment decontamination procedures, and groundwater sampling.



C.T. MALE ASSOCIATES ENGINEERING,
SURVEYING, ARCHITECTURE,
LANDSCAPE ARCHITECTURE &
GEOLOGY, D.P.C

STANDARD OPERATING PROCEDURE

COLLECTION OF QUALITY CONTROL SAMPLES

March 6, 2020

Print Technical Reviewer Signature Date

Print QA Manager Signature Date

Review of the SOP has been preformed and the SOP still reflects the current practice			
Initials		Date	
Initials		Date	

SOP: COLLECTION OF QUALITY CONTROL SAMPLES

1.0 PURPOSE

The purpose of this standard operating procedure is to describe the procedures used in the collection and handling of field quality control (QC) samples: field blanks, equipment blanks, trip blanks, field (masked) duplicate samples, matrix spikes and matrix spike duplicate samples.

The recommended procedures in this SOP should be followed unless conditions make it impractical or inappropriate to do so. Modifications should be noted in the applicable documentation and communicated to appropriate personnel.

2.0 SCOPE

This procedure applies to all C.T. Male personnel engaged in the collection of samples from several Site media (water, soil, etc.) for laboratory analysis per an accepted New York State Department of Environmental Conservation (NYSDEC) Analytical Services Protocol (ASP) or Environmental Protection Agency (EPA) laboratory method.

3.0 GENERAL

As part of this SOP, there are limitations, and they are as follows:

- Laboratory specific QC samples (e.g., method blanks, laboratory control samples) are not discussed within this SOP.

4.0 RESPONSIBILITIES

4.1 Project Manager

Field sampling personnel, in conjunction with the Project Manager are responsible for overall compliance with this technical procedure. The Project Manager, in conjunction with the client, develops the site specific scope of work (e.g., Work Plan, Sampling Analysis Plan (SAP), etc.).

4.2 Site Personnel

Experienced Field Personnel are responsible for the accurate collection of QC samples and the laboratory is responsible for the accurate set-up and analysis of QC samples. Project staff are responsible for ordering sample containers prior to the sampling event.

4.3 Health & Safety Officer

The Health & Safety Officer is responsible for site-specific HS&E and overall compliance with project HS&E requirements. The Health & Safety Officer conducts personal protective equipment (PPE) evaluations, selects the appropriate PPE for the project, lists the requirements in the project-specific HASP, coordinates with the Field Team Leader to complete the PPE program, and conducts project audits on the effectiveness of the HS&E program.

4.4 Site Specific Health and Safety Officer

The role of Site Specific Health and Safety Officer is designated to the Field Team Leader by the Project Manager and/or Health & Safety Officer, to assist in implementing the project-specific HASP. The Project Manager and/or Health & Safety Officer assists the Field Team Leader with the HS&E program, implements the PPE requirements described in the project-specific HASP, and receives input from project staff that the assigned PPE requirements and on-going HS&E procedures are effective.

5.0 EQUIPMENT, REAGENTS, and SUPPLIES

The following items are applicable to this SOP:

- Laboratory certified containers appropriate for the required analysis
- Chemical resistant gloves (e.g. nitrile)
- Sample labels
- Matrix specific sampling devices and equipment
- Sample containers / media
- Analyte free water

6.0 PROCEDURE

This section provides the definitions and sampling procedure(s) for QC samples.

6.1 Calibration

Calibration is not applicable to this SOP.

6.2 Sampling

General considerations to be taken into account when planning and conducting sampling operations are the required sample amount, sample holding times, sample handling, and special precautions for trace contaminant sampling. Matrix specific

sampling SOPs should be followed for the collection and preservation of samples. The QC samples will be handled in the same manner as the sample group for which they are intended (i.e. stored and transported with the sample group).

6.2.1 Field Blank

Field blank samples are prepared on-site and are a sample of analyte-free water exposed to environmental conditions at the sampling site by transfer from one vessel to another. It measures field and laboratory sources of contamination. Generally, blanks are collected for each parameter of interest.

6.2.2 Equipment Blank (Rinsate Blank)

Equipment blank (or rinsate blank) samples are prepared on-site by pouring analyte-free water through decontaminated sample collection equipment (e.g., bailer or pump, hand-trowel, etc.) and collecting the “rinsate” in the appropriate sample container. If collecting a blank for dissolved metals or dissolved organic carbon, the rinsate will be filtered before adding to the sample container. In addition to the field sources of contamination that may be introduced in the transferring of samples to one vessel to another, an equipment blank also tests the potential cross contamination from incomplete decontamination. Generally, blanks are collected for each parameter of interest.

6.2.3 Trip Blank

Trip blank samples are used when sampling volatile organic compounds (VOC) only. Analyte-free water is used for water samples and methanol (or other applicable sample preservative) is used for soil samples. They are prepared or provided by the laboratory along with the VOC sampling containers prior to a sampling event. Trip blank sample containers are not to be opened in the field and accompany the VOC samples during collection, storage, and transport to the analytical laboratory. There must be one set of trip blank samples per sample cooler containing VOC samples from the Site. The trip blanks should be listed on the chain-of-custody (COC) along with the samples and the analysis required. The purpose of the trip blank sample is to determine the extent of potential contamination introduced during sample transport and handling.

6.2.4 Field (Masked) Duplicate

Field (masked) duplicate samples are two aliquots of a sample collected at the same time using the same procedures, equipment, and types of containers as the required samples. The samples are collected by rotating sampling containers from the original/source sample to the field duplicate sample (using the same exact methods for both). The field duplicate sample is identified with an alias (e.g., M-1 or FD) on the sample container label and on the COC to avoid alerting laboratories to the source of the sample duplicated. The time collected should be omitted on this sample also. Analyses of field duplicate samples are the same as the required samples and give a measure of the precision associated with sample collection, preservation, and storage, as well as laboratory procedures. Field duplicate samples are submitted to the laboratory for the same analyses as the original/source sample.

6.2.5 Matrix Spike (MS) and Matrix Spike Duplicate (MSD)

Matrix Spikes (MS) and Matrix Spike Duplicate (MSD) samples are two aliquots of a sample to which known quantities of analytes are added (spiked) in the laboratory. The MS and MSD are prepared and analyzed exactly like their native/source sample aliquot. For some analyses, it is required that three separate sample aliquots are collected in the field for each analysis. One aliquot is analyzed to determine the concentrations in the native/source sample, a second sample aliquot serves as the MS and the third sample aliquot serves as the MSD. The purpose of the MS and MSD is to quantify the bias and precision caused by the sample matrix.

7.0 Quality Control and Quality Assurance (QA/QC)

The QC activities described below allow the self-verification of the quality and consistency of the work.

7.1 QA/QC Samples

The frequency of QC samples is generally one field blank/equipment blank/field duplicate/MS/MSD per twenty samples; however, specific project requirements may require alternative sampling frequencies.

7.2 Measurement Criteria

Criteria are defined in project specific documentation.

8.0 RECORDS

The field technician will document the type and number of QC samples collected during each sampling event on a COC and in a project dedicated field logbook or on field log data sheets.

Examples of common field documentation are available in SOP Field Notes. Field documentation specific to this SOP are listed below:

- Field Log Data Sheet
- COC
- Sample label
- Custody seal (if applicable)

Field documentation and COC will be kept electronically in the project files.



C.T. MALE ASSOCIATES ENGINEERING,
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STANDARD OPERATING PROCEDURE

DOMESTIC TRANSPORT OF SAMPLES TO LABORATORIES IN THE USA

March 6, 2020

Print

Technical Reviewer

Signature

Date

Print

QA Manager

Signature

Date

Review of the SOP has been preformed and the SOP still reflects the current practice			
Initials		Date	
Initials		Date	

**SOP: DOMESTIC TRANSPORT OF SAMPLES TO
LABORATORIES in United States of America**

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to describe the procedures necessary for personal delivery or shipment of samples from locations within the United States of America and its territories to analytical laboratories located within the United States of America and its territories. This procedure applies to the transportation of ground and surface water, soil, wipe, sediment, paint chip, debris, and air samples to the appropriate laboratory.

The recommended procedures in this SOP should be followed unless conditions make it impractical or inappropriate to do so. Modifications should be noted in the applicable documentation and communicated to appropriate personnel. Significant changes may result in a revision or newly created SOP.

2.0 SCOPE

This procedure applies to all C.T. Male personnel engaged in the collection of samples from several Site media (water, soil, etc.) for laboratory analysis.

3.0 GENERAL

As part of this SOP, there are limitations, and they are as follows:

- Maintaining proper sample temperatures (<6°C or ambient air temperature in accordance with the analytical method requirements) and delivering samples to the laboratory within 24 to 48 hours from collection are primary concerns.
- This procedure does not apply to the transportation of ground and surface water, soil, wipe, sediment, paint chip, debris, and air samples to laboratories outside of the United States of America – States and Territories.

4.0 RESPONSIBILITIES

4.1 Project Manager

Field sampling personnel, in conjunction with the Project Manager are responsible for overall compliance with this technical procedure. The Project Manager, in conjunction with the client, develops the site specific scope of work (e.g., Work Plan, Sampling Analysis Plan (SAP), etc.).

4.2 Site Personnel

Experienced Field Personnel shall ensure the security, temperature, and packaging of environmental samples during transport and shipment.

4.3 Health & Safety Officer

The Health & Safety Officer is responsible for site-specific HS&E and overall compliance with project HS&E requirements. The Health & Safety Officer conducts personal protective equipment (PPE) evaluations, selects the appropriate PPE for the project, lists the requirements in the project-specific HASP, coordinates with the Field Team Leader to complete the PPE program, and conducts project audits on the effectiveness of the HS&E program.

4.4 Site Specific Health and Safety Officer

The role of Site Specific Health and Safety Officer is designated to the Field Team Leader by the Project Manager and/or Health & Safety Officer, to assist in implementing the project-specific HASP. The Project Manager and/or Health & Safety Officer assists the Field Team Leader with the HS&E program, implements the PPE requirements described in the project-specific HASP, and receives input from project staff that the assigned PPE requirements and on-going HS&E procedures are effective.

5.0 EQUIPMENT, REAGENTS, and SUPPLIES

The following items are applicable to this SOP:

- Rigid Cooler
- Ziplock baggies
- Absorbent padding
- Ice
- Chain of Custody record

- Directional arrow labels may be used to ensure samples remain upright
- Environmental Samples
- Bubble wrap / bubble bags (inner packing material)
- Heavy bag for containing ice and preventing leakage of melted water
- Packing tape
- Shipping papers – if shipped via delivery service

6.0 PROCEDURE

6.1 Packaging of water, soil and sediment samples (requiring chilled preservation per the analytical method of analysis)

6.1.1 Packaging Samples

Place samples in a rigid cooler, pack glass containers in bubble wrap or other cushioning material to avoid breakage. (Note: Bubble-wrap is the preferred packing material.) Methanol sample containers must be placed in a Ziploc® Baggie to meet shipping requirements for preventing leaks. Place samples and cushioning material in strong plastic bag with enough absorption padding to absorb all of the liquid in the packaging. Be sure to zip tie this bag shut.

Add enough ice to maintain a constant temperature at $< 6^{\circ}\text{C}$, (but not frozen) until the samples arrive at the laboratory. Package ice in double-lined bags to ensure sample labels will not be compromised, and the cooler(s) will not leak melt water.

Before sealing cooler, fill out the chain-of-custody form completely and include required copies with the samples (see Standard Operating Procedure for Documentation on a Chain-of-Custody).

Adhere two to three strips of packaging tape on the cooler from top to bottom, and adhere an additional strip of tape covering the gap between the lid and sides of cooler to seal the cooler to avoid leakage. Custody Seals must be adhered on the cooler if project quality assurance plan or sampling and analysis plan require them. The custody seal must be adhered to the crack of the lid and the side of the cooler to ensure the cooler lid has not been tampered with in transit. Be sure to attach the courier shipping label to the top of the cooler.

6.1.2 Labeling

A secondary label with the same information should also be attached with packaging tape to the cooler in event that the original label is damaged or destroyed during sample shipment.

When shipping samples preserved with methanol, the cooler must have a Dangerous Goods in Excepted Quantities label (see attachment 4) placed on the outside of the cooler. Be sure to add the number “3” to each label in permanent marker to indicate the hazard class being shipped.

Each cooler shall not exceed 500 mL of Methanol (16 vials, 30 mL of methanol per vial) and each vial shall not have more than 30 mL of methanol to meet the requirements of a dangerous good in excepted quantities. Acid/base preserved samples vials are often 40 mL or larger and do not qualify for excepted quantities.

Directional arrow labels can be attached to the cooler to insure the cooler remains upright during shipping. Directional arrow labels should be attached to the outside of the cooler to keep the cooler in an upright position during sample shipment.

6.2 Packaging of wipe, paint chips, debris, and air samples (requiring ambient air temperature per the analytical method of analysis)

6.2.1 Packaging Samples

Place the samples in a cooler or cardboard box in a manner that will avoid breakage.

Adhere two to three strips of packaging tape from top to bottom on the cooler or box. Fill out the chain- of-custody completely and include required copies with the samples (see Standard Operating Procedure for chain-of-custody record).

Custody Seals must be adhered over the lid if project quality assurance plan or sampling and analysis plan require them. The custody seal must be adhered to the crack of the lid and the side of the cooler or over the flaps of the box to ensure the container remained shut and has not been tampered with in transit.

6.3 Sample Storage

For samples requiring ice as a preservative, the samples will be bubble wrapped, bagged immediately after collection, stored in a sample cooler, packed on double bagged wet ice and accompanied with the proper chain-of-custody documentation. The samples will be kept cold ($< 6^{\circ}\text{C}$, but not frozen) until receipt at the laboratory, where they are to be stored in a refrigerated area.

For samples that are stored at ambient air temperature, the samples (wipe, paint chip, debris, and air samples) will be placed in a baggie or shipping carton (i.e. cardboard box) and accompanied with the proper chain-of-custody documentation.

For sample shipments, custody seals shall be present, at minimum; the coolers must be taped shut with two to three straps of packing tape. All samples will be kept secured to prevent tampering. If sample coolers are left in a vehicle or field office for temporary storage, the area will be locked and secured. The coolers must be delivered to the laboratory via hand or over-night delivery courier in accordance with all Federal, State and Local shipping regulations.

Note: Samples may have to be stored indoors in winter to prevent freezing.

6.4 Shipping Consideration

6.4.1 Shipment / Delivery

Once the cooler is packed to prevent breaking of bottles, the proper chain-of-custody (COC) documentation is signed off, sealed in a plastic bag, and placed in the cooler.

All samples will be kept secured to prevent tampering. If sample coolers are left in a vehicle or field office for temporary storage, the area will be locked and secured.

Custody seals may be present, but at a minimum, the coolers must be taped shut to prevent the lid from opening during shipment.

The coolers must be delivered to the laboratory via hand or overnight delivery courier in accordance with all Federal, State and Local transportation regulations and this SOP.

6.4.2 Transport/ Delivery Options

Account for samples before shipping and compare to the chain of custody (see Standard Operating Procedure for chain-of-custody record). Ship samples during times when the laboratory will be able to accept and analyze them. Whenever possible, select mode of transport/delivery to ensure delivery to the laboratory will occur with ample EPA recommended holding time remaining for the specified analytical methods required for the samples. Avoid sending samples during holidays and weekends. Federal, State and Local shipping regulations must be met.

Personal Delivery. The samples are delivered to the laboratory by the field technician(s). The chain-of- custody record is signed and dated by the laboratory representative.

Local Courier. The same procedures are followed as above; i.e., the chain-of-custody record is signed and dated and the top copy is sent with the samples. The cooler or box is then secured with packaging tape and a courier is called for pick up of the samples from the Site to the designated laboratory.

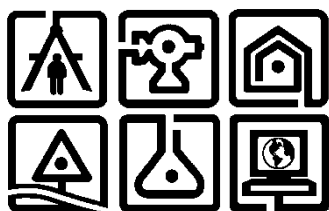
Overnight Courier. Follow the procedures above, replacing the local courier service with a courier that provides overnight services (examples Federal Express, United Parcel Service, Speedy Delivery). Date, project number, type of delivery desired, weight, and number of coolers or boxes should be included.

7.0 RECORDS

Examples of common field documentation are available in “Compendium of Field Documentation” or CT Male SOP, ‘Note Taking and Field Logs’. Field documentation specific to this SOP are listed below:

- Chain-of-custody record

Chain-of-custody records are kept at field offices and in the electronic project files at CT Male office. Other SOP subjects referenced within this SOP: Standard Operating Procedure for chain-of-custody record.



C.T. MALE ASSOCIATES ENGINEERING,
SURVEYING, ARCHITECTURE &
LANDSCAPE ARCHITECTURE, D.P.C

STANDARD OPERATING PROCEDURE

DRILLING and ASSOCIATED SAMPLING METHODS

Revision 2

December 28, 2017

_____ Print	_____ Technical Reviewer	_____ Signature	_____ Date
_____ Print	_____ QA Manager	_____ Signature	_____ Date

Review of the SOP has been preformed and the SOP still reflects the current practice			
Initials		Date	
Initials		Date	

SOP: DRILLING and ASSOCIATED SAMPLING METHODS

1.0 PURPOSE

This standard operating procedure (SOP) provides guidance for selecting and implementing the proper drilling methods for collecting subsurface soil and groundwater samples and for installing groundwater monitoring wells using hollow stem auger (HSA) and/or direct push system (DPS) drilling methods.

2.0 SCOPE

This SOP applies to all C.T. Male Associates personnel and sub consultants engaged in drilling activities. This SOP focuses on the commonly used drilling tasks and applications and should be used in conjunction with other project SOPs, including the following:

- SOP: Note Taking and Field Logs.
- SOP: Organic Vapor Monitoring and Air Monitoring.
- SOP: Surface and Subsurface Soil Sampling.
- SOP: Equipment Decontamination Procedures.

Should field tasks and procedures be added to a project that is not included in this SOP, they will be defined in the project-specific Health and Safety Plan (HASP), before implementation. Changes to field procedures and/or equipment will be documented on the Environmental Services Field Logs and Subsurface Exploration Logs.

3.0 GENERAL

Selecting the proper drilling equipment for environmental and geotechnical sampling and monitoring well installation is a part of field investigations. This SOP describes hollow stem auger and direct push drilling methods generally used for subsurface soil sampling and groundwater monitoring well installation and the commonly used tools for these techniques.

In addition to selecting the proper type of drilling technology, drilling activities should conform to State regulations and be supervised by an experienced geologist or

environmental scientist. Either the drilling contractor or C.T. Male Associates will obtain permits, applications, and other documents required by state and local authorities and the client. In addition, the following general guidelines should be considered during planning and implementation of drilling investigations:

- Review background information for the investigation area. This includes identifying and understanding the type(s) of contaminant(s) released, the manner of release, and the affected media.
- Select the proper drilling technology and drill rig.
- Determine the inside diameter of the soil borehole needed to accomplish the drilling objectives and provide adequate sample volume.
- Before mobilization to each boring location, determine that the location is free of subsurface or overhead utilities. The drilling contractor will be responsible for obtaining utility clearance prior to mobilizing to the project site.
- Take appropriate precautions during drilling to avoid introducing contaminants into the borehole.
- Drill boreholes in areas of no or low anticipated contamination by first progressing toward areas of increasing contamination. Under ideal conditions, upgradient areas without contamination should be drilled first.
- When drilling boreholes through more than one water-bearing zone or aquifer, take measures to prevent cross-connection or cross-contamination of the zones or aquifers, such as using telescoped casing.
- Before mobilization to each boring location, decontaminate the drill rig and drilling equipment placed into the borehole by steam cleaning, using high-pressure hot water, or similar methods according to SOP Equipment Decontamination Procedures. The drill rig must not leak any fluids that may enter the borehole, contaminate equipment placed in the borehole, or impact lands and waters of the State.

- Avoid using drilling mud, synthetic drilling fluids, or petroleum- or metal-based pipe joint compounds and other potential contaminants unless necessary. To reduce the cross contamination for PFAS, avoid using tubing, liners, pumps, valves and wiring with polytetrafluoroethylene (PTFE), Vitron, Niskin, GoFlo, or ethylene tetrafluoroethylene, Teflon check balls, o-rings, compression fittings, and impellers. If their use is necessary, drilling fluids must not introduce or mask contaminants. Provide safety data sheets (SDS) for drilling fluids proposed for downhole use before field work and describe procedures for containment and disposal of fluid in the remedial action work plan. If it is necessary to add drilling mud to the borehole during drilling to stabilize the hole or control down-hole fluid losses, use only high-yield sodium bentonite clay free of organic polymer additives.
- If it is necessary to add water to the borehole during drilling to control flowing and heaving soils, use only potable water from a documented clean source. If drilling to potentially sample for PFAS, the drilling water will need to be filtered to ensure the source water is PFAS free. Refer to the site specific work plan. Potable or filtered water volume added to a borehole must be developed from the well. If potable or filtered water is added to the borehole, an equal volume of water must be developed from the borehole in addition to the standard well development volume.
- To the extent practical, restore the site to its pre-investigation conditions. Record information pertinent to documenting the above requirements on the Environmental Services Field Logs.

4.0 RESPONSIBILITIES

4.1 Project Manager

The Project Manager is responsible for providing adequate resources and ensuring that field staff have adequate experience and training for project-specific implementation of the health, safety, and environment (HS&E) management process and project SOPs. The Project Manager and Health & Safety Officer cooperatively have overall HS&E program responsibility; however, specific tasks may be delegated to other project staff. The Project Manager retains ultimate HS&E responsibility for the project. The Project

Manager will solicit the appropriate technical expertise to adequately identify the drilling and sampling technology for the job given the current understanding of the site lithology.

4.2 Health & Safety Officer

The Health & Safety Officer is responsible for site-specific HS&E and overall compliance with project HS&E requirements. The Health & Safety Officer conducts personal protective equipment (PPE) evaluations, selects the appropriate PPE for the project, lists the requirements in the project-specific HASP, coordinates with the Field Team Leader to complete the PPE program, and conducts project audits on the effectiveness of the HS&E program.

4.3 Site Specific Health and Safety Officer

The role of Site Specific Health and Safety Officer is designated to the Field Team Leader by the Project Manager and/or Health & Safety Officer, to assist in implementing the project-specific HASP. The Project Manager and/or Health & Safety Officer assists the Field Team Leader with the HS&E program, implements the PPE requirements described in the project-specific HASP, and receives input from project staff that the assigned PPE requirements and on-going HS&E procedures are effective.

4.4 Field Team Leader

The Field Team Leader, in conjunction with the Project Manager and Health & Safety Officer, is responsible for overall compliance with this SOP. The Field Team Leader is responsible for following these procedures or delegating drilling tasks to field personnel. The Field Team Leader should document that subcontractors comply with this SOP.

4.5 Field Geologist/Environmental Scientist

The Field Geologist/Environmental Scientist supervises the drilling and collection of lithologic samples, and records field data as described in this SOP, the project-specific HASP, and the SOP for Note Taking and Field Logs.

5.0 DRILLING OVERVIEW OF METHODS

5.1 Hollow Stem Auger Drilling

Hollow stem auger drilling is a form of rotating auger drilling, consisting of continuous-casing, segmented auger sections with screw-flights that are rotated into the subsurface under downward pressure. The auger section is typically equipped with a drill bit and cutting teeth. Drill cuttings are brought to the surface by a conveyor action created by the rotating screw flights and drill bit. The auger sections maintain borehole stability even in unconsolidated material.

Continuous (every two feet) or nominal (every five feet) soil samples will be collected in general accordance with the procedures of ASTM D-1586, Standard Method for Penetration Test and Split Barrel Sampling of Soils. A standard split barrel sampler, which is 24-inches long and 2-inches in diameter, will be used for sampling.

Generally, hollow stem auger drilling is limited to depths less than 100 feet where lithology is unconsolidated. Multiple auger sections are connected in series to create a “drill string” with clamping pins or threaded bolts. Hollow stem auger drilling usually requires a larger drill rig than is used with direct push system drilling, and the entire rig can stand between 20 and 40 feet high, requiring high overhead clearance. At sites where groundwater is relatively shallow (less than 50 feet) and direct push system drilling is not feasible because of lithology (cobbles and boulders, glacial till, etc. are present), or where a larger diameter boring is required, it is common to use hollow stem auger drilling.

In situ soils may be sampled through the center of the hollow stem auger drill stem. An advantage of hollow stem auger drilling is that the auger sections can be left in place to hold the borehole open and prevent borehole collapse. Hollow stem augers are specified by the internal diameter of the hollow stem, not by the size of the hole they drill. Augers with a minimum inner diameter of 4 inches will be required to install a 2-inch monitoring well, to create adequate annular space between the auger casing and well casing to construct well filter sand pack and bentonite seal. It is preferable to use a larger inner-diameter auger (6 inches) to install a 2-inch monitoring well; however, the benefits should be weighed against the additional investigation-derived waste volumes

that will be generated and the cost. If a 4-inch diameter monitoring well is required, the inner auger diameter must be 6 to 8 inches.

Boreholes should be advanced using pre-cleaned and decontaminated augers and sampling equipment, according to SOP for Surface and Subsurface Soil Sampling. Boreholes that are not converted to wells should be abandoned by returning non-impacted soil cuttings to the borehole and filling remaining borehole space with a grout/bentonite mixture having an approximate ratio of 20:1.

5.2 Flush Joint Casing Drilling

Drilling with flush joint casing is similar to auger drilling and is most often advanced with the same drill rig. Typical casing diameters are 4, 6 and 8 inches, but can vary. Casing lengths are typically 5 and 10 feet. Casing sections are joined with flush thread fittings. The casing sections can be spun into the ground while applying downward pressure on the drill string while adding water to the casing to flush the drill cuttings. Casing sections can also be advanced into the ground with either a 140 lbs. or 300 lbs. hammer with a casing drive head connected to the top of the drill string. A roller bit and water are then used to remove and flush soils from the casing.

Soil samples are collected in the same manner as when using auger casing. Installation of monitoring wells is essentially the same as using auger casing. Four-inch diameter casing is typically used for installing two-inch diameter monitoring wells, and six-inch casing when installing four-inch diameter wells.

Flush joint casing is also used to seal off the overburden soils when advancing the borehole into bedrock with a rock core barrel or roller bit.

Boreholes should be advanced using pre-cleaned and decontaminated augers and sampling equipment, according to the SOP for Surface and Subsurface Soil Sampling. Boreholes that are not converted to wells should be abandoned by returning non-impacted soil cuttings to the borehole and filling remaining borehole space with a grout/bentonite mixture having an approximate ratio of 20:1.

5.3 Direct Push System Drilling

Direct push system technologies involve a category of drilling equipment that hydraulically pushes or drives small-diameter, hollow steel rods into the subsurface without rotating the drill rods. Some drill rigs may be “combo rigs,” capable of conducting both direct push and rotating hollow stem auger drilling operations. Direct push system drilling uses a combination of a hydraulically powered percussion hammer, a downward hydraulic push, and the weight of the vehicle on which the system is mounted to drive rods into the subsurface. Direct push system methods push a continuous tube sampler into the subsurface by laterally displacing soil to make a path for the sampler, so no cuttings are generated. Direct push system drilling is commonly used for shallow applications (less than 50 feet); however, depending on the lithologic conditions, it may be used as deep as 120 feet.

Direct push system technology is typically limited to unconsolidated formations that are relatively free of cobbles or boulders or dense glacial till. Refusal may occur if there are too many cobbles, boulders, or other consolidated formation materials. However, since direct push system drilling is relatively fast, drilling refusal at a desired location due to cobbles may be mitigated by abandoning the hole and relocating to an adjacent location.

Direct push system boreholes generally cannot be sampled deeper than the water table because unconsolidated materials cave in once the drive rods are removed. However, caving may be mitigated by advancing casing with an inner drill rod used for sampling, allowing for sampling and well installation below the water table.

Outside diameters of samplers and boring tools generally range from 0.75 to 3.5 inches. If installation of monitoring wells is planned, the inside diameter of the boring should typically ranges from 1.5 to 3.5 inches (for 1- to 2-inch diameter wells).

Direct push system technologies provide the following advantages over conventional drilling methods:

- Minimal ground disturbance, with a small-diameter boring that is easy to abandon.

- No cuttings, which eliminates the need for handling, containerizing, sampling, and disposing of potentially contaminated investigation-derived waste (unless samples are brought to the surface).
- Relatively faster boring advancement as compared to hollow stem auger drilling.
- Relatively faster monitoring well installation as compared to hollow stem auger drilling if small-diameter wells (0.75 to 1.25 inches in diameter).

Boreholes should be completed using pre-cleaned and decontaminated drive points, rods, and sampling equipment according to SOP for Surface and Subsurface Soil Sampling. Boreholes that are not converted to wells should be abandoned by returning non-impacted soil cuttings to the borehole and filling remaining borehole space with a grout/bentonite mixture having an approximate ratio of 20:1.

5.4 Rotosonic Drilling

Sonic drilling advances a borehole using resonant high frequency vibrations to fluidize the formation at the drill bit. Vibrations created in the sonic head at the top of the drill string move rapidly up and down the drill string with intense vibration at the drill bit; resonant frequencies of 50 to 200 Hertz. Sonic drilling could be used for continuous collection of soil samples and advancement into bedrock.

The installation of monitoring wells with a Rotosonic borehole is essentially the same as when employing either hollow stem augers or flush joint casing.

Boreholes should be advanced using pre-cleaned and decontaminated augers and sampling equipment, according to SOP for Surface and Subsurface Soil Sampling. Boreholes that are not converted to wells should be abandoned by returning non-impacted soil cuttings to the borehole and filling remaining borehole space with a grout/bentonite mixture having an approximate ratio of 20:1.

6.0 DRILLING AND SAMPLING PROCEDURES

6.1 Drilling Contractor Responsibilities

Working around drill rigs can be dangerous. As a result, increased consciousness and vigilant observation of drilling activities are necessary to reduce the risk of injury to workers involved with drilling. Safe work requires that good communication is maintained between the driller/helper and the Field Geologist/Environmental Scientist during drilling activities. Encourage the driller to notify the Field Geologist/Environmental Scientist routinely of the depth(s) at which changes in drilling rates become evident and immediately of other drilling observations that may indicate subsurface obstructions or utilities. The SOP for utilizing the machinery to drill the borehole(s) or well(s) onsite will be conducted by the drilling subcontractor, following their SOP.

At a minimum, the following activities should be conducted as part of the drilling program:

- Conduct a kickoff meeting prior to drilling. Describe tasks to be conducted and a tentative schedule. As the drilling progresses, discuss the remaining tasks and revised schedule with the drill crew daily. Communicate progress and issues with the Project Manager.
- Hold a health and safety tailgate meeting prior to the commencement of drilling activities, each day.
- Wear proper PPE at all times.
- Conduct air monitoring as specified in the project-specific HASP and according to SOP Organic Vapor Monitoring and Air Monitoring.
- Visit the site and drilling locations with the driller to identify potential site hazards and obstacles before mobilization and setup.
- Document that the drilling contractor has obtained underground and overhead utility clearance. Require driller to maintain proper clearance with aboveground utilities and obstructions.

- Set up proper traffic controls if working in an area where there are traffic hazards.
- Establish exclusion and decontamination zone using barriers, flagging tape, or other methods to prevent unauthorized access to the drilling location according to the site-specific HASP.
- Inspect the drill rig for leaking lines or other hazards and have the driller test safety switches and demonstrate that they work. No fluids should leak from the drill rig.
- Document that personnel working around the drill rig are trained and instructed, familiar with drill rig operation, and understand the task to be performed.
- Identify the locations of the fire extinguisher(s) and first aid kit(s), and verify that they are readily available for use.
- Maintain good housekeeping on and around the drill rig.
- Establish a staging area for storing investigation-derived waste and decontaminating augers and sampling equipment.
- Establish a core logging and sample collection area at a safe location within sight of the drill rig.
- Place sampling equipment and soil recovered from the subsurface on plastic sheeting or similar dedicated material to avoid potentially contaminating the ground surface.
- Log downtime that occurs because of drilling contractor equipment failure, weather, site access, or other issues, on the Environmental Services Field Log and/or Subsurface Exploration Log.

7.0 HEAVING AND FLOWING SOILS

Heaving and flowing soils within the saturated zone may complicate drilling procedures. When encountered, use appropriate drilling techniques to minimize potential impacts; these include using drilling fluids or a drill-stem plug. Minimize the

use of drilling fluids if possible. However, when necessary, it is permissible to add potable water from a documented, clean source, or when sampling for PFAS the use of filtered water to the borehole to control heaving and flowing soils as long as identification of the saturated zones during drilling is not compromised and the drilling fluid can be removed during development so that representative water levels can be obtained. Drilling fluid volume added to a borehole must be developed from the well. If potable or filtered water is added to the borehole, develop an equal volume of water from the borehole, in addition to the standard well development volume. If a drill-stem plug is used, slowly release the plug from the end of the drill-string while at total borehole depth.

8.0 RECORDS

Record field activities and soil boring field data on the Environmental Services Field Logs and Subsurface Exploration Logs.

9.0 DEFINITIONS

- Auger section: A segment of hollow auger outer casing with helices (flights) welded around the exterior that conveys soil cuttings from the drill bit to the surface when rotated.
- Borehole: The downward hole in the subsurface lithology created by drilling activities.
- Combo drill rig: Drill rigs capable of conducting both direct push system and rotating hollow stem auger drilling operations.
- Cutting shoe: The cutting end of a direct push system drill string.
- Direct Push System (DPS): A drilling technology that hydraulically pushes or drives small diameter, hollow steel rods into the subsurface without rotating the drill rods.
- Down time: Non-productive time on the part of the drilling contractor or their subcontractors related to scheduling, breakdown, or other operational delays.
- Drill bit: The cutting end of a drill string that typically has cutting teeth.

- Drill string: Multiple auger or casing sections connected in series with a drill bit or cutting shoe connected at the driving end of the drill string.
- Flush Joint Casing: Lengths (usually 5 to 10 ft, casing diameters can be 4, 6 and 8 inches) of steel tubing provided with a box thread at one end and a matching pin thread on the opposite end. Coupled, the lengths form a continuous tube having uniform inside and outside diameters throughout its entire length.
- Heaving or Flowing Soils: Loose medium- and fined-grained soils in a confined, water bearing zone or aquifer that tend to rise up into the drill stem when the unit confining the aquifer is breached by the drill bit. This happens because the water in the aquifer has a pressure head great enough to cause upward flow into the drill stem with enough velocity to overcome the weight of the sand, creating a quicksand condition and carrying sand into the drill stem. Usually associated with hollow stem auger drilling.
- Hollow Stem Auger (HSA): A form of rotating auger, consisting of continuous-casing, segmented auger sections with helices (screw-flights) that are rotated into the subsurface under downward pressure.
- Investigation-derived waste (IDW): Contaminated waste generated during investigation and/or remedial activities, including wash water, purge water, personal protective equipment, sampling tools and supplies, and soil cuttings.
- Photoionization detector (PID): A detection tool that measures organic vapor concentrations in air using the photoionization potential of the contaminant.
- Probe drive string: The outer casing and drive string used during direct push system drilling.
- Sample shoe: A retaining device, typically made of polyethylene, that allows soils to enter a sampler but does not allow them to exit through the end of the sampler.

- Solid-point drive point: A solid point placed within the open, hollow end of a direct push system cutting shoe so that soil may not push up and into the probe drive string.
- Split- spoon sampler: A soil coring device that consists of a length of carbon or stainless steel tubing split longitudinally and equipped with a sample shoe and a drive head.
- Standard Penetration Test (SPT): A soil test used to evaluate the relative density of unconsolidated soil by counting the number of times a weighted hammer (typically 140 pounds) is repeatedly raised and dropped over a 30-inch height for every 6 inches of soil penetration.
- Unconsolidated formation: A subsurface soil formation that is unstable or loose with a low ability to remain cohesive without retainment. Soils that easily slough or erode back into an open borehole without an outer casing to keep the borehole open.



C.T. MALE ASSOCIATES ENGINEERING,
SURVEYING, ARCHITECTURE,
LANDSCAPE ARCHITECTURE &
GEOLOGY, D.P.C

STANDARD OPERATING PROCEDURE

EQUIPMENT DECONTAMINATION PROCEDURES

December 28, 2017

Print Technical Reviewer Signature Date

Print QA Manager Signature Date

Review of the SOP has been preformed and the SOP still reflects the current practice			
Initials		Date	
Initials		Date	

SOP: EQUIPMENT DECONTAMINATION PROCEDURES

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide the step-by-step procedures for field decontamination of environmental sampling equipment and personal protective equipment (PPE). Decontamination of equipment and PPE is designed to document that sample cross-contamination, human-health exposure, and contamination transport are minimized.

2.0 SCOPE

This procedure applies to all C.T. Male Associates personnel engaged in collecting environmental samples or operating in environments in which hazardous or contaminating substances are suspected to be present.

3.0 GENERAL

Decontamination consists of physically removing contaminants from the surface of sampling equipment and materials potentially exposed to those contaminants. A decontamination plan should be based on conservative, worst-case scenario, using available information about the work area. The plan can be modified, if justified by supplemental information. Initially, the decontamination plan assumes that protective clothing and equipment which leave the exclusion zone are contaminated. Based on this assumption, a system is established to wash and rinse non-disposable equipment and dispose of disposable equipment.

The type of decontamination procedures and solutions needed at each site should be determined after considering the following site-specific conditions:

- The type of equipment to be decontaminated.
- The type of contaminant(s) present.
- Extent of contamination.
- Potential human, environmental and ecological risk scenarios.

4.0 RESPONSIBILITIES

4.1 Project Manager

The Project Manager is responsible for overall compliance with this procedure and for documenting that field staff are properly trained and meet project Health, Safety, and Environmental (HS&E) requirements.

4.2 Health & Safety Officer

The Health & Safety Officer is assigned to oversee site-specific HS&E and overall compliance with project HS&E requirements. The Health & Safety Officer conducts PPE evaluations, selects the appropriate PPE for the project, lists the requirements in the project-specific Health and Safety Plan (HASP), coordinates with the Field Team Leader to complete and document the PPE program, and conducts project health and safety audits on the effectiveness of the HS&E program.

4.3 Site Health and Safety Officer

The role of Site Health and Safety Officer is delegated to the Field Team Leader by the Project Manager and/or Health & Safety Officer to assist in implementing the project HASP. The Field Team Leader assists the Project Manager and/or Health & Safety Officer with the health and safety program, implements the PPE requirements described in the project HASP, and receives input from project staff that the assigned PPE requirements and on-going HS&E procedures are effective.

4.4 Field Team Leader

The Field Team Leader is responsible for following these procedures or delegating tasks to technicians to perform decontamination tasks. The Field Team Leader should document that subcontractors are taking necessary precautions to decontaminate field equipment before and throughout field activities. The Field Team Leader should also document that decontamination waste and PPE are disposed of properly.

5.0 PROCEDURE

Decontaminate non-disposable sampling equipment used at the site both before activities begin, after each sample is collected, and if needed when leaving the exclusion zone. Decontaminate drilling and excavation equipment both before activities begin, between each investigation/remedial action location, and leaving the exclusion zone.

Materials and solutions used for decontamination procedures will be non-hazardous and will not be used if they could potentially contaminate samples (i.e., acids and solvents).

5.1 Decontamination Area

Set up a decontamination zone adjacent to the exclusion zone for drill rigs, excavators, other sampling equipment, and personnel. Select and set up the decontamination area so that decontamination fluids and soil wastes can be managed in a controlled area with minimal risk to the surrounding environment. The decontamination area should be large enough to allow temporary storage of cleaned equipment and materials before use, as well as to stage drums of decontamination investigation/remediation-derived waste. In the case of large decontamination areas (for example, for hollow stem auger and excavator bucket decontamination), line each area with heavy-gauge plastic sheeting and include a collection system designed to capture potential decontamination investigation/remediation-derived waste. Decontamination areas will be constructed to mitigate overspray while performing decontamination activities.

Smaller decontamination tasks, such as sampling equipment (i.e., trowels, shovels, split-barrel sampler, macro-core sampler, etc.) decontamination, may take place at the sampling locations. In this case, required decontamination supplies and equipment should be mobilized to the site and smaller decontamination areas for personnel and portable equipment will be provided as necessary. These locations will include basins, buckets and/or tubs to capture decontamination investigation/remediation-derived waste, which will be transferred to larger containers as necessary.

5.2 Decontamination Equipment

The following is a list of equipment and materials that may be needed to perform decontamination:

- Concrete or synthetic material-lined decontamination pad.
- HDPE sheeting/membrane to serve as secondary containment for liquids.
- Brushes and flat-bladed scrapers.
- Garden-type water sprayers (without oil-lubricated, moving parts).

- High-pressure washer.
- Portable steam cleaner.
- Sump or collection system for contaminated liquid.
- Wash basins and buckets.
- Spray and rinse bottles.
- Potable PFAS free water, deionized water, laboratory-grade water and laboratory grade detergent (Liquinox or Alconox).
- Plastic waste bags.
- Leak-tight liquid waste containers (55-gallon drums or similar).
- Bulk solid waste containers (super-sacks, 55-gallon drums, or similar).

5.3 Decontamination Procedures

5.3.1 Personnel and Personal Protective Equipment

Decontamination of personnel and PPE reduces the potential for human-health exposure to contaminants via ingestion, absorption, and inhalation. Personnel and PPE will be decontaminated as outlined in the site-specific HASP. Concerns regarding personnel and PPE decontamination procedures may be addressed directly with the Project Manager, Health & Safety Officer, and/or Site Specific Health and Safety Officer.

5.3.2 Sampling Equipment

Conduct consistent decontamination of sampling equipment to maintain the quality of the samples collected. Decontaminate equipment that comes into contact with potentially contaminated samples. Disposable equipment intended for one-time use that is factory wrapped generally does not need to be decontaminated before use, unless evidence of contamination is present. Disposable equipment, such as disposable bailers, spoons is preferred over reusable equipment; use wherever appropriate. Decontaminate sampling equipment, including split-barrel and macro-

core samplers, hand augers, reusable bailers, spoons, trowels, shovels, and pumps used to collect samples for chemical analyses before each use and before sampling at a new sampling location. Take the following steps to decontaminate non-dedicated sampling equipment:

- Decontamination personnel will wear the appropriate PPE as required by the site-specific HASP.
- The sequence of actual decontamination will be as follows:
 - Remove gross contamination (such as pieces of soil) from equipment at the sampling site.
 - If heavy petroleum residuals are encountered during sampling, an appropriate solvent such as methanol will be used to remove petroleum residues from sampling equipment, but should be kept to a minimum. If a solvent is used, it must be properly used, collected, stored, and disposed of according to the site-specific HASP. If heavy petroleum residuals are not encountered, this step should be omitted.
 - If PCB oils are observed on sampling equipment an appropriate solvent, such as Mycelx, will be used to remove liquid PCB residues from sampling equipment. If a solvent is used, it must be properly used, collected, stored, and disposed of according to the site-specific HASP.
 - Wash water-resistant equipment thoroughly and vigorously with potable water and laboratory-grade detergent such as Liquinox, or Alconox and use a bristle brush or similar utensil to remove remaining residual contamination. This shall be done within a containment tub or similar.
 - Rinse equipment thoroughly with potable water (1st and 2nd rinse).
 - Rinse equipment thoroughly with distilled or deionized water (3rd and 4th rinse).

- For sensitive field instruments, rinse equipment with distilled, deionized, or American Society for Testing and Materials (ASTM) reagent grade water (3rd rinse).
- Air dry at a location where dust or other fugitive contaminants may not contact the sample equipment. Alternatively, wet equipment may be dried with a clean, disposable paper towel to assist the drying process. Equipment should be dry before reuse.
- If the equipment is not used soon after decontamination, it should be covered or wrapped in new, HDPE sheeting to protect the decontaminated equipment from fugitive contaminants before reuse.
- Store decontaminated equipment at a secure, unexposed location out of the weather and potential contaminant exposure.
- Depending on site conditions and the number of samples collected at each location, rinse and detergent water may be replaced with new solutions between borings or sample locations.

5.3.3 Groundwater Sampling

Proper decontamination between wells is necessary to avoid introducing contaminants from the sampling equipment. For decontamination of peristaltic pumps, replace the pump head tubing after sampling each well. If sampling with pumps such a submersible, bladder, or similar pump in which mechanisms of the pump come in direct contact with contaminated water, or sampling with a reusable stainless steel bailer, decontaminate the pump or bailer. The following steps will be used for pumps and bailers contaminated with dissolved phase contamination only:

1. Wash the exterior of the pump or bailer and associated cable thoroughly and vigorously with potable water, or filtered water where PFAS is a contaminant of concern, containing the non-phosphate laboratory-grade detergent Liquinox or Alconox. Washing will be completed using a dedicated wash bristle brush or similar brush.

2. Place the pump into clean potable or filtered water wash basin/reservoir containing Liquinox or Alconox making sure that the pump intake is fully submerged and the pump outlet is allowed to flow directly back into the wash reservoir. It should be noted if the wash water and wash basin are not clean, the contaminants from previously used wash water including debris or soils would recirculate through the pump. Set the pump to a very low flow rate and turn the pump on, allowing the wash water to re-circulate through the pump mechanism for a minimum of 5 minutes. Disregard this step for reusable bailers.
3. Initially, rinse the pump or bailer by repeating Steps 1 and 2 using potable water, a dedicated rinse bristle brush, and a rinse basin/reservoir containing only potable water (1st and 2nd rinse).
4. Final rinse the pump or bailer by duplicating Step 3 using distilled, deionized, or ASTM reagent grade water (3rd and 4th rinse).
5. Dry off excess water with a clean, disposable paper towel and allow to air dry at a location where dust or other fugitive contaminants may not contact the sample pump or bailer.

If the pump or bailer is used to sample groundwater containing non-aqueous phase liquid (NAPL) or other heavy petroleum contamination, field-dismantle (field-strip) the equipment per the manufacturer's guidelines and decontaminate the interior and exteriors surfaces of the pump or bailer using the wash, double rinse, and dry steps outlined in the previous Steps 1, 3, 4, and 5 above. If significant heavy petroleum residue is encountered during decontamination, use an appropriate solvent such as methanol to remove petroleum residues from pump or bailer surfaces. This should be kept to a minimum. If a solvent is used, it must be properly used, collected, stored, and disposed of according to the project-specific HASP. If heavy petroleum residuals are not encountered, omit this step.

5.3.4 Measurement Devices and Monitoring Equipment

For water quality instruments, oil-water interface indicators, water level indicators, continuous water level data-loggers, and other field instruments that have the

potential to come into contact with site media, at a minimum, wash with dilute laboratory-grade detergent (Liquinox or Alconox) and double rinse with potable and distilled/deionized water before and after each use using a similar procedure as discussed in Section 5.3.2. If heavy petroleum residuals are encountered during sampling, use an appropriate solvent such as methanol to remove petroleum residues per the manufacturer's maintenance guidelines.

5.3.5 Drilling and Subsurface Soil Sampling Equipment

Drilling equipment and associated materials will be decontaminated by the drilling contractor prior to drilling operations and between borings, or as outlined in the site specific work plan. Decontaminate tools used for soil sampling (i.e., split-barrel and macro-core samplers) before and between collecting analytical samples. Thoroughly clean external and internal surfaces of drilling equipment (that is, drill bits, auger, drilling stem, and hand tools) before beginning drilling operations and between borings using the following basic sequence:

- Remove as much gross contamination as possible off equipment at the sampling site.
- Wash equipment thoroughly and vigorously with high-temperature potable water using a high-pressure washer and/or steam cleaner, if possible. If steam cleaning is not going to be used it will be outlined in the site specific work plan. A bristle brush is also suggested to remove persistent gross contamination.
- Rinse equipment twice thoroughly with potable water (1st and 2nd rinse).
- Rinse equipment twice thoroughly with filtered water (3rd and 4th rinse), when PFAS are contaminants of concern or will be sampling at the site.
- Air dry at a location where dust or other fugitive contaminants may not contact the sample equipment. Equipment should be dry before reuse.
- Store decontaminated equipment at a location away from potential exposure from fugitive contamination.

5.3.6 Decontamination of Earthwork Equipment

Wash earthwork equipment (such as excavators, back-hoes, and trucks) with high-pressure potable water and/or filtered water, if possible, before leaving a contaminated area, using similar steps as outlined in Section 5.3.5.

Portable steam-cleaners and hand washing with a brush and detergent, followed by a potable water and filtered water rinse, can also be used. In some instances, tires and tracks of equipment may only need to be thoroughly brushed with a dry brush. Take particular care with the components in direct contact with contaminants, such as tires and backhoe buckets. Earthwork equipment (or localized part) that may come in direct contact with analytical samples (i.e., sample collection of soils in direct contact with the excavator bucket) must be thoroughly decontaminated before excavation activities and between sample locations.

5.3.7 Air Sampling Equipment

For non-laboratory manifold equipment, methanol soak manifold components for a minimum of two hours. Remove from the methanol bath and place in an oven pre-heat to 90 ° C and continue to heat manifold components for at least 3 hours or until interior and exterior surface inspections of the manifold components indicate that they are free of liquid methanol.

5.4 Investigation/Remediation-Derived Wastes

Depending on the contaminant, potentially hazardous investigation/remediation-derived wastes (such as wash water or rinsate solutions) will be contained in 55-gallon drums and staged in a designated waste storage area.

6.0 RECORDS

Sampling personnel will be responsible for documenting decontamination of sampling, excavation and drilling equipment. Record information on the Environmental Services Field Logs. The information entered on the Environmental Services Field Logs concerning decontamination should include the following:

- Decontamination personnel.
- Decontamination solutions used (i.e., Alconox, Liquinox, distilled water, etc.).

- Date and time (start and end).
- Location of decontamination.
- General decontamination methods, tools used, and observations.
- Manufacturer names and lot numbers of decontamination solutions.
- Location and amount of decontamination investigation/remediation-derived wastes collected, stored, and/or disposed.
- Identification number, date, sampling area, and information of stored decontamination investigation/remediation-derived wastes.
- Decontamination investigation/remediation-derived waste spills or releases and associated corrective actions.

7.0 DEFINITIONS

Decontamination Area: An area that is not expected to be contaminated and is upwind of suspected contaminants.

Decontamination Equipment: Equipment used during the process of decontamination of personnel or sampling equipment.

Drilling and Subsurface Soil Sampling Equipment: Equipment and tools used during the process of drilling or subsurface soil sampling.

Health and Safety Plan: A plan developed to require that hazards associated with a site are evaluated prior to site entry.

Measurement\Monitoring Equipment: Equipment used to check or evaluate site conditions.

Personal Protective Equipment (PPE): Personal health and safety equipment used to protect the individual from contaminant exposure, physical injury, or death.

Potable Water: Water acceptable for drinking and washing.

Sampling Equipment: Equipment used during the process of sample collection.

Earthwork Equipment: Heavy earthmoving equipment typically used for excavation and test pit investigations.



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LANDSCAPE ARCHITECTURE &
GEOLOGY, D.P.C

STANDARD OPERATING PROCEDURE

FIELD WATER QUALITY MEASUREMENTS and CALIBRATION

March 6, 2020

Print Technical Reviewer Signature Date

Print QA Manager Signature Date

Review of the SOP has been preformed and the SOP still reflects the current practice			
Initials		Date	
Initials		Date	

SOP: FIELD WATER QUALITY MEASUREMENTS and CALIBRATION

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to describe general methods for calibrating, maintaining, and operating water quality meters and probes used for groundwater sampling. This technical procedure provides general guidelines; however, the manufacturer's manual describing calibration and standard operating procedures for each field instrument should be referred to for complete calibration and operating instructions

2.0 SCOPE

This SOP applies to all C.T. Male, sub consultants and subcontractors engaged in ground water sampling activities. Other applicable project SOPs, including the following:

- SOP: Note Taking and Field Logs.
- SOP: Organic Vapor Monitoring and Air Monitoring.
- SOP: Groundwater Sampling.
- SOP: Equipment Decontamination Procedures.
- SOP: Collection of Quality Control Samples.
- SOP: Documentation on a Chain-of-Custody.
- SOP: Domestic Transport of Samples to Laboratories in USA.

3.0 GENERAL

Water quality meters are typically used in the field to measure the following parameters:

- Dissolved oxygen (DO)
- Oxidation-reduction potential (ORP)
- Conductivity
- pH
- Turbidity
- Temperature

Instructions for maintenance and operation of all these field instruments are described in the operation manuals provided by the manufacturer.

4.0 RESPONSIBILITIES

4.1 Project Manager

The Project Manager verifies that monitoring well and piezometer installation procedures comply with this SOP and the requirements of the enforcing agencies. Alternate installation requirements and procedures required by local agencies or other modifications must be documented and approved by the Project Manager.

4.2 Health & Safety Officer

The Health & Safety Officer oversees site-specific health, safety, and environment (HS&E) protocols and overall compliance with project HS&E requirements. The Health and Safety Officer conducts personal protective equipment (PPE) evaluations, selects the appropriate PPE, lists the requirements in the Project-specific Health and Safety Plan (HASP), coordinates with the Project Manager and Field Manager to certify the PPE, and conducts project health and safety audits to evaluate the effectiveness of the HS&E program.

4.3 Site Safety and Health Officer

The role of Site Safety and Health Officer is delegated to the Field Team Leader by the Project Manager to assist in implementing the project HASP. The Project Manager and/or Health & Safety Officer assists the Field Team Leader with the health and safety program, implements the PPE requirements described in the project HASP and receives input from project staff that the assigned PPE requirements and on-going HS&E procedures are effective.

4.4 Field Team Leader

The Field Team Leader will know how to use the field instruments and conduct the daily instrument calibrations. They will also maintain adequate documentation of the calibration process and measurements taken while using the instruments.

5.0 PROCEDURES

The following sections describe typical materials, equipment, and procedures for soil vapor probe installation and soil vapor sampling.

5.1 Instruments and Supplies

Water quality meters and instruments vary in their manufacturer and model number. Below is a list of commonly used meters and instruments, and other related supplies that can be used for field water quality measurements:

- YSI 556 MPS Multi-parameter Instrument
- YSI 650 MDS Multi-parameter datalogger
- YSI 6-Series sonde or similar multiparameter probe
- YSI 5083 Flow Cell or similar flow-thru cell
- Hach 2100P Portable Turbidimeter
- Data transfer connector cables
- Discharge hoses (two)
- Fittings to attach sample tubing to flow through cell (barbs and master flex pump tubing, PFAS free)
- Distilled water
- Calibration solutions and buffers (ORP, conductivity, pH, and turbidity)

5.2 Calibration

Calibrate all instruments for all field parameters daily before collecting water quality data, according to the manufacturer calibration specifications developed for the instrument being calibrated. In addition, if there are anomalous readings during sample collection, stop sample collection and re-calibrate, if possible. Document field calibration in the Field Logs. Section 5.2.4 has a table of calibration acceptance limits for DO, pH, conductivity, and ORP.

If a field instrument will not calibrate, perform troubleshooting as described in the manufacturer's manual. Check that the calibration standards have not expired. If the issue cannot be resolved, use a backup instrument. If one is not available, consult with the Project Manager on whether data collection should continue and on any other corrective actions to be taken. Flag any data recorded from a meter with calibration

problems on the Groundwater Purge and Sampling Field Datasheet, and other appropriate Field Logs.

5.2.1 pH Calibration (2-point or 3-point calibration)

Calibrate all instruments recording pH daily, using at minimum a 2-point calibration method. A 2-point calibration uses only two pH buffer calibration solutions (typically pH 7 and pH 10) and is valuable only if the water being monitored is known to be either basic or acidic. If the pH is known to vary between 5.5 and 7, a 2-point calibration with a pH 7 and pH 4 buffer solutions is recommended. When starting the calibration process, calibrate with buffer pH 7 first regardless if performing a 2 or 3 point calibration.

Follow the recommended manufacturer pH calibration instructions for additional detailed instruction for the instrument being used. Enter all pH calibration values based on the appropriate temperature as labeled on the pH calibration solutions used. Record the final pH calibration reading, with the corresponding temperature, in the Field Logs.

If the pH of water being measured is unknown, a 3-point calibration method is preferred. Using this calibration, the pH sensor is calibrated with a pH 7 buffer and two additional buffers (such as pH 4 and pH 10). The 3-point calibration method accounts for the full pH range and assures maximum accuracy when the pH of the media to be monitored cannot be anticipated. Typically, the procedure for a 3-point calibration is the same as for a 2-point calibration, but the instrument may prompt you to select a third pH buffer.

pH Buffer Calibration Check Acceptance limits:

Record the pH millivolts for each calibration point. The acceptable mV outputs for each buffer are shown below. If used standard units, see section 5.2.4 for a table of calibration acceptance limits for pH using standard units:

pH 7 mV value = 0 mV +/- 50 mV

pH 4 mV value = +165 to +180 from 7 buffer mV value

pH 10 mV value = -165 to -180 from 7 buffer mV value

- A value of +50 or -50 mVs in buffer 7 does not indicate a bad sensor.

- The mV span between pH 4 and 7 and 7 and 10 mV values should be ≈ 165 to 180 mV. 177 is the ideal distance. The slope can be 55 to 60 mV per pH unit with an ideal of 59 mV per pH unit.
- If the mV span between pH 4 and 7 or 7 and 10 drops below 160, clean the sensor and try to recalibrate.

5.2.2 Conductivity Calibration

Perform daily calibration for conductivity according to the recommended manufacturer's calibration instructions. Conductivity is typically entered as milliSiemens per centimeter (mS/cm) at 25 degrees Celsius ($^{\circ}\text{C}$). Conductivity standard solutions have values such as 1.413 mS/cm or 1.409 mS/cm; which is equivalent to 1413 or 1409 microSiemens per centimeter ($\mu\text{S/cm}$); and 1413 or 1409 $\mu\text{mho/cm}$. The meter is calibrated by entering the conductivity of the solution being monitored and the instrument will calibrate, and the instruments screen will indicate if the calibration has been accepted. Record the final conductivity calibration reading, with the corresponding temperature, on the Field Calibration Sheet. See section 5.2.4 for a table of calibration acceptance limits for conductivity.

5.2.3 Calibration Check of the Oxidation Reduction Potential (ORP) Probe

A calibration check of the ORP probe can be performed by placing it into a ZobellTM solution that is within approximately 10°C of the expected groundwater temperature, or as close to groundwater temperature as practical. This is not a calibration solution, but a check that the probe is working properly. ZobellTM solution has a short shelf life, typically lasting only 3 months. If expired, make or obtain new solution before measurement. The ZobellTM reading is dependent upon temperature and should fall within ± 10 mV of the ORP reading shown on the meter. The table with the appropriate temperature and Zobell Solutions Value in mV will be listed in the field instruments operation manual. Record the ZobellTM solution ORP reading on the Field Log. See section 5.2.4 for a table of calibration acceptance limits for OPR probe.

5.2.4 Calibration Check acceptance limits for DO, pH, Conductivity, ORP

Below is a table of calibration acceptance limits for each parameter listed.

Sensor	Calibration Solution Value	Calibration Check Acceptance Limits
Dissolved Oxygen (%)	Assumed 100% air saturation based on barometric pressure and/or stabilized reading at time of calibration	± 0.5 mg/L of saturated value
Dissolved Oxygen (mg/L)	Solution of known value (0-20 mg/L)	± 0.5 mg/L of saturated value
Conductivity (mS/cm)	1.409	$\pm 10\%$ of standard or 20 uS/cm, whichever is greater
pH (Standard Units)	4.00 (if used)	± 0.3 Standard Units
pH (Standard Units)	7.00	± 0.3 Standard Units
pH (Standard Units)	10.00 (if used)	± 0.3 Standard Units
ORP (mV)	Zobell Solution (231.0 mV @ 25°C)	± 10 mV for temperature based calculation

5.2.5 Turbidity Calibration (4-point calibration)

Perform routine calibration of the turbidity instrument according to the recommended manufacturer's calibration instructions. Turbidity instruments should be calibrated using a 4-point calibration method; typical calibration standards used are <0.1 NTU, 20 NTU, 100 NTU, and 800 NTU StablCal standard or formazin standard. This 4-point calibration method accounts for turbidity over a wide range from 0 to 1000 NTU. Record the calibration standard value and the calibrated turbidity value of each calibration point (< 0.1, 20, 100, and 800 NTU) on the Field Calibration Sheet.

5.3 Water Quality Instrument Field Measurement and Usage

The general procedures for measuring groundwater quality parameters and flow-through cell setup are as follows:

1. Before taking any field measurements, calibrate instruments according to the manufacturer's procedures and record the calibration on the Field Calibration Sheet.
2. Perform a saturated air check of the DO probe by placing a wet piece of cloth in the cap that covers the probe. Check the dissolved oxygen reading against the theoretical value of saturated oxygen at different elevations. If the instrument is not reading in the proper range, it should be recalibrated, or the dissolved oxygen probe membrane should be replaced.

3. Secure the multi-meter sonde (or analyte specific probes) to the flow-through cell. Connect a short discharge tube to the effluent connector at the top of the flow-through cell and run the other end of the discharge tube into a 5-gallon purge water capture bucket.
4. Place the tube from the pump directly into the 5-gallon purge water bucket and start to purge (pump) for approximately 1 to 2 minutes or until the purge water begins to visually clear up. The intent is to limit any initially high turbidity water from filling and settling in the flow-through cell.
5. Once the turbidity has stabilized, briefly turn off the pump and secure the tube from the pump to the influent connector at the bottom of the flow-through cell. Turn on the pump again and then allow the flow-through cell to completely fill with water. Effort should be made to keep air bubbles from collecting in the flow-through cell. To remove any collected air from the cell, disconnect the probes from the cell while pumping until all the air escapes and then reconnect the probes.
6. Continue pumping and begin low-flow purging of the monitoring well at a flow rate of approximately 1 liter (0.25 gallons) every 3 minutes or 0.1 gallon per minute (gal/min).
7. Routinely measure and record the DO, ORP, conductivity, pH, turbidity, temperature, and current groundwater level throughout the purge at approximately every 3- to 5-minute routine measured interval. A minimum of three of these parameters should be monitored and recorded. Record the purge groundwater parameters on the Field Log.
8. Continue to measure and record the groundwater parameters and current groundwater level until the parameters stabilize according to the following stabilization criteria, or until 3 well casing volumes are purged. Groundwater parameters are considered stable after purging if three successive readings are within:
 - ± 0.5 °C temperature
 - ± 0.1 pH
 - $\pm 5\%$ conductivity

- ± 10 millivolt (mV) ORP
- $\pm 10\%$ DO or three consecutive readings less than or equal to 0.5 mg/L apart
- $\pm 10\%$ turbidity or three consecutive readings ≤ 5 nephelometric turbidity units (NTUs) apart

9. Note the following before and during water quality measurement and groundwater purging:

- Obtain the typical ranges for the water quality parameters at a well (or site) prior to measurement and purging, if possible, and bring these values to the field for reference during sampling. Water quality parameter ranges can often be obtained from historical groundwater purging and sampling events. These previous values should be used as clues to determine if an instrument is reading correctly and/or is drifting during water quality measurement.
- ORP and DO measurements should always correlate with each other. Generally ORP should be negative whenever DO is near or less than 1 milligram per liter(mg/L); likewise, DO should be greater than 1 mg/L if ORP is positive.
- DO measurement should always be positive and range between 0 and 14.62 mg/L.
- ORP measurements should range between -500 mV and 275 mV.
- The pH of environmental samples will typically range from 6 to 8 pH units.
- When measuring turbidity, be sure to clear any moisture or dust off of the turbidity sample cell and emplace the sample cell and light cover completely and securely. Also, be sure to put the turbidity instrument out of direct sunlight (it should be shadowed), or else light interference may provide false readings.

10. When parameters have stabilized, record final measurements and collect samples as specified in SOP Groundwater Sampling Procedures.

5.4 Storage

Perform the following tasks each day upon conclusion of using any water quality measurement instrument:

1. Decontaminate the instrument(s): rinsing with distilled water, a dilute solution of Alconox or Liquinox (or similar), and rinsing with distilled water as specified in SOP Decontamination of Sampling Equipment.
2. Moisten protective caps that are made to protect the tips of probes or sensors with fresh water and replacing them back to their probes or sensors for storage while the instrument is not in use.
3. Recharge or replace batteries on any instruments and meters to verify full battery charge for next use.
4. Store the instrument or meter in the protective case provided with the instrument or meter.
5. Take any additional storage and maintenance steps recommended by the manufacturer as specified in the instruments operations and maintenance manual.

5.5 Service and Maintenance

Perform service and maintenance according to manufacturer's instructions.

6.0 RECORDS

Record all instrument calibration information on a Field Calibration Datasheet or Log. Calibration information that should be recorded into the field log and field book for each instrument calibrated includes the brand and model number, unique identification number, type, lot number, expiration date of any calibration solutions, and results of the calibration. Record all field data collected during groundwater sampling on a Groundwater field logs.



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STANDARD OPERATING PROCEDURE

MEASURING STATIC WATER LEVEL, IMMISCIBLE LAYERS (DNAPL and LNAPL), and TOTAL WELL DEPTH IN WATER

January 26, 2018

Print

Technical Reviewer

Signature

Date

Print

QA Manager

Signature

Date

Review of the SOP has been preformed and the SOP still reflects the current practice

Initials

Date

Initials

Date

SOP: MEASURING STATIC WATER LEVEL, IMMISCIBLE LAYERS (DNAPL and LNAPL), and TOTAL WELL DEPTH IN WATER

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to describe the procedure for measuring static water level, light non-aqueous phase liquid (LNAPL) level, dense non-aqueous phase liquid (DNAPL) level, and total well depth in a groundwater well.

2.0 SCOPE

This SOP applies to all C.T. Male Associates personnel and subcontractors engaged in measuring static water level, light non-aqueous phase liquid (LNAPL) level, dense non-aqueous phase liquid (DNAPL) level, and total well depth in a groundwater well. This SOP focuses on the measuring static water level tasks and should be used in conjunction with other applicable project SOPs, including the following:

- SOP: Note Taking and Field Logs.
- SOP: Organic Vapor Monitoring and Air Monitoring.
- SOP: Equipment Decontamination Procedures.

3.0 RESPONSIBILITIES

3.1 Project Manager

The Project Manager will develop the site specific scope of work based upon the needs of the project. These work plans can include a site specific work plan, Health and Safety plan, community air monitoring plan, field sampling plan, and a QAPP.

3.2 Field Team Leader

The Field Team Leader will develop site specific or direct the water level measuring procedures to be used and direct field technicians in the proper procedures in the SOPs. The Field Team Leader shall know the requirements for water level measurements, measuring immiscible layers, and total well depth and maintain adequate documentation of the sampling process.

3.2 Field Technician

Experienced Field Technicians are responsible for the proper measurement and documentation of water levels, immiscible (does not dissolve in water) layers (DNAPL and LNAPL), and total water depth. They are also responsible for maintaining the equipment in working order and aid in troubleshooting equipment issues.

3.3 Health & Safety Officer

The Health & Safety Officer oversees site-specific health, safety, and environment (HS&E) protocols and overall compliance with project HS&E requirements. The Health and Safety Officer conducts personal protective equipment (PPE) evaluations, selects the appropriate PPE, lists the requirements in the Project-specific Health and Safety Plan (HASP), coordinates with the Project Manager and Field Manager to certify the PPE, and conducts project health and safety audits to evaluate the effectiveness of the HS&E program.

3.4 Site Safety and Health Officer

The role of Site Safety and Health Officer is delegated to the Field Team Leader by the Project Manager to assist in implementing the project HASP. The Project Manager and/or Health & Safety Officer assists the Field Team Leader with the health and safety program, implements the PPE requirements described in the project HASP and receives input from project staff that the assigned PPE requirements and on-going HS&E procedures are effective.

4.0 EQUIPMENT, REAGENTS, and SUPPLIES

The following items are applicable to this SOP:

- Electronic water level indicator
- Personnel protective equipment
- Oil/water interface probe

5.0 PROCEDURE

This section below describes the procedures and equipment used for measuring static water level, light non-aqueous phase liquid (LNAPL) level, dense non-aqueous phase liquid (DNAPL) level, product thickness, and total well depth in a groundwater well.

5.1 Calibration

The electronic water level indicator and oil/water interface probe will be tested prior to use to ensure they are functioning properly. Instruments that are not properly functioning should be tagged for inspection by the Field Team Leader or sent to the manufacturer for repair. AA or 9V batteries are normally used for a power source; spare batteries should be kept on hand.

5.2 Measurements

The water level, total depth, and immiscible layers are measured prior to well purging or sampling. For new wells, measurements should not be taken until the water table has stabilized—preferably 24 hours after well installation and/or development. Decontaminate reusable equipment per CT Male’s SOP ‘Equipment Decontamination Procedures’.

5.2.1 Water Level

Groundwater levels are usually measured at all wells on the same day and before purging any wells. Typically, the water level is measured with an electronic water level indicator probe that is lowered into the well. An oil/water interface probe may also be used if oil layers may be encountered (see section below). The electronic water level indicator consists of a spool of marked cable, a probe attached to the end, and an indicator. When the probe comes in contact with the water, the circuit is closed, and a meter light and/or tone signals the contact.

To ensure consistent results, groundwater level measurements are made in reference to an established point (e.g., top of well casing, top of riser pipe). Water level measurements are made from the high side of the riser pipe or well casing unless otherwise specified. If the top of the riser is apparently level, take the

readings at the north side of the riser. The depth to water is indicated by the markings on the cable. Read the water level directly off of the tape. The groundwater level should be measured three times consecutively (without completely winding up the water level indicator probe) to help ensure accuracy. Record the water level to the nearest 0.01 foot on the appropriate field sheets.

5.2.2 Total Well Depth

Determine the total well depth by lowering the water level indicator probe (or equivalent) into the well. After feeling the bottom of the well, raise and lower the water level indicator probe three times to ensure the bottom is being felt. Record the total well depth to the nearest 0.01 foot on the appropriate field sheets.

5.2.3 Immiscible Layer Thickness - Oil/Water Interface Probe

An immiscible layer may consist of LNAPL or DNAPL. LNAPL has a specific gravity less than water and is typically at the water surface of a well. DNAPL has a specific gravity greater than water and tends to accumulate at the bottom of a well. An oil/water interface probe is used to measure the layer and consists of a flat measuring tape with a probe attached to the end, an indicator, and a grounding mechanism. After grounding the instrument to a metal source (well casing), determine the product thickness by slowly lowering the probe into the well.

5.2.3.1 LNAPL

If LNAPL (floating product) is present, a steady tone will activate. If there is no floating product, an intermittent tone will activate indicating the air/water interface (water level). Raise and lower the probe gently to clear product from the conductivity sensor and to determine the exact upper level of the floating product. The air/product level should be measured three times consecutively (without completely winding up the product level interface probe) to help ensure accuracy. Read the level of the air/product interface from the measuring tape and record to the nearest 0.01 foot.

Continue lowering the probe through the product until the original signal changes to an intermittent tone. This signals the contact of the water level. Raise and lower the probe gently to clear product from the conductivity sensor and to determine the exact lower level of the floating product. The product/water interface should be measured three times consecutively (without completely winding up the product level interface probe) to help ensure accuracy. Read the level of the product/water interface from the measuring tape and record to the nearest 0.01 foot.

5.2.3.2 DNAPL

If there isn't any LNAPL, an intermittent tone will activate when the water level is reached. Continue lowering the probe until a steady tone is activated indicating the upper level of the product layer. Raise and lower the probe gently to clear product from the conductivity sensor and to determine the exact upper level of the product. The water/product level contact should be measured three times consecutively (without completely winding up the product level indicator probe) to help ensure accuracy. Read the level of the water/product interface from the measuring tape and record to the nearest 0.01 foot.

Continue lowering the probe through the product until coming into contact with the bottom of the well. Raise and lower the probe gently to ensure the bottom is being felt. The bottom of the well should be measured three times consecutively (without completely winding up the product level interface probe) to help ensure accuracy. Read the depth to the bottom of the well from the measuring tape and record to the nearest 0.01 foot.

5.3 Data Reduction/Calculations

The water column in the well is calculated by subtracting the measured water level from the total well depth.

The difference in the LNAPL upper level and the LNAPL lower level is the LNAPL thickness. The difference in the DNAPL upper level and the bottom of well is the DNAPL thickness.

5.4 Disposal

Waste generated by this process will be disposed of in accordance with Federal, State and Local regulations and CT Male's SOP 'Investigative Derived Waste'. Where reasonably feasible, technological changes have been implemented to minimize the potential for environmental pollution.

6.0 RECORDS

The field technician(s) will document the water level, total depth, or product level measurements on the water level data sheet and the field log data sheet for each well, if required.

Examples of common field documentation are available in CT Male's "Note taking and Field Logs". Field documentation specific to this SOP are listed below:

- Field Sampling Report
- Field Log Data Sheet
- Water Level Data Sheet

Other CT Male SOP subjects referenced within this SOP: field water quality measurements and groundwater sampling.



C.T. MALE ASSOCIATES ENGINEERING,
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LANDSCAPE ARCHITECTURE &
GEOLOGY, D.P.C

STANDARD OPERATING PROCEDURE

NOTE TAKING and FIELD LOGS

March 6, 2020

Print Technical Reviewer Signature Date

Print QA Manager Signature Date

Review of the SOP has been preformed and the SOP still reflects the current practice			
Initials		Date	
Initials		Date	

SOP: NOTE TAKING AND FIELD LOGS

1.0 PURPOSE

This standard operating procedure (SOP) provides programmatic criteria for the content of field logs.

2.0 SCOPE

This procedure applies to all C.T. Male Associates field personnel engaged in note taking and data collection to be recorded on Environmental Services Field Logs.

3.0 GENERAL

An essential part of any environmental field project is proper documentation. The primary documentation used to record site data are Environmental Services Field Logs, which describe the history of field activities and summarize field measurements. This is necessary to demonstrate that the data are representative and have been obtained according to required procedures. The field logs may be used as evidence in legal proceedings to defend procedures and techniques employed during site investigations and remedial actions. Therefore, it is important that documentation be factual, complete, accurate, consistent, and clear.

4.0 DOCUMENT SOURCES

Field documents consist of the following hardcopy, printed on standard paper and placed in a non-waterproof resistant folder or aluminum clipboard, or electronic types:

- Environmental Services Field Logs.
- Soil Boring Logs.
- Test Pit Log Sheets.
- Organic Vapor Headspace Analysis Logs.
- Monitoring Well Construction Logs.
- Groundwater Services Field Log.
- Monitoring Well Water Level Logs.

- Monitoring Well Purging Logs.
- Monitoring Well Development Logs.
- Photographs and Photographic Logs.
- Laboratory Chain of Custody Forms.
- Shipping Waybill and Manifest Documents.
- Other field activity and/or field data documentation.

5.0 RESPONSIBILITIES

5.1 Project Manager

Field sampling personnel, in conjunction with the Project Manager are responsible for overall compliance with this technical procedure. The Project Manager, or designee, is responsible for verifying that the data entries made on the field logs comply with this technical procedure. The Project Manager will also provide copies of Environmental Services Field Logs to the Quality Assurance Officer for general review.

5.2 Site Personnel

All site personnel who make field log entries are required to read this procedure before engaging in this activity. The Project Manager, or designee, will inform personnel who will be responsible for field log entries, care, and maintenance.

6.0 PROCEDURE

6.1 Environmental Services Field Logs

Field logs will contain lined, consecutively numbered pages. Record the following information on the front page of Field Logs:

- Date.
- Time On-Site/Time Off-Site.
- Project name.

- C.T. Male Associates project number.
- Purpose (i.e., completion of test borings/soil sampling, etc.).
- Weather conditions.
- Personnel present at the site and site visitors.

Entry of field activities, events, data, and other relevant project task information will be documented daily (at minimum) throughout the course of field activities. The following minimum requirements must be followed when entering daily activities on the Field Logs:

- The field activity and date must be recorded at the top of each page.
- The top page corner of each page will be consecutively numbered.
- Entries on the field logs should be preceded with the time written in military units. The time should be recorded frequently and at the point of events or measurements that are representative of the activity being logged.
- Changes must be made with a single, strike-out line through the deletion. Changes must be initialed and dated. Scribbling or blotting out deletions is unacceptable.
- Entries should be made in waterproof ink unless inclement weather prevents pens from working. Except on site where samples are being collected for PFAS, then a non-waterproof pen will be used.
- Entries must be written clearly and legibly enough so that any reviewer can read and understand the entry.
- The bottom of each page should be signed and dated by the author.

Events and observations that should be recorded should include, but are not limited to, the following:

- The field activities/tasks with date and time.

- The location(s) and field conditions in which the field task will be conducted.
- The names and organization(s) of field task staff and/or visitors, including C.T. Male Associates' personnel, subcontractors, clients, and regulators.
- Site conditions (upon arrival and departure) and changes in site conditions.
- Current weather and changing weather conditions that might impact field activities.
- Relevant field observations, major task decisions, comments, or other valuable information will be documented throughout the course of site activities. Entries will be as specific and detailed as possible and practical.
- If field datasheets, soil boring log sheets, photographs, sample location coordinates, or other documentation types are specified by a procedure, the information need not be duplicated, but the relevant documentation type and/or forms must be referenced in the Field Logs and attached to the Field Logs, if applicable.
- Documentation of field instrument calibration or reference to appropriate field calibration sheets.
- Field map sketches will be drawn with an approximate North arrow and, if possible, approximate scale. Boring or sample locations with measurements (swing ties) to at least two fixed objects to locate points for mapping.
- Changes and/or deviations from task protocols (such as sampling procedures) outlined in governing planning documents.
- Reason(s) for noted deviations, and whom the deviation was discussed with and authorized by.
- Problems, downtime, or delays and the reasons for the problem or delay.
- Upgrade or downgrade of personal protective equipment.

- Equipment make, model, and property numbers or serial numbers used at the site.
- Health and safety monitoring equipment, including calibration procedures and results and actual and background readings.
- Start and end times of sampling.
- Sampling steady-state parameters.
- Decontamination times and methods.
- Type, amount, and disposal methods used for investigation/remedial action derived wastes.

When samples are collected, the following should be recorded on the log sheets or laboratory Chain of Custody form:

- Sample location and depth.
- Sample identification number.
- Sample date and time.
- Sample methodology.
- Sample type and media.
- Field sampler initials.
- Sample analyses requested.
- Sample preservation type.
- Quality control sample numbers and types.
- Chain-of-custody number.
- Name of individual to whom the samples are relinquished.

- Laboratory service provider in which samples are to be relinquished.
- Shipping Service(s) or method(s) used for sample delivery.
- Date and time of shipment.
- Shipping Waybill or manifest number.

6.2 Field Datasheets and Forms

Other data documentation types (including Soil Boring/Test Pit Log Sheets, Photographic Logs, Laboratory Chain of Custody Forms, Shipping Waybill and Manifest Documents, and similar documents) are part of the field records. Generally, the use of these documentation types are task-specific and when used should be attached and referenced within the field logs. However, specific data entered on these types of documents will not typically be documented verbatim on the field logs, so document handling and archiving must be performed in the same manner as the field logs.

6.3 Electronic Data Documents

Electronic data documents may consist of photographs; GPS and survey coordinate data, field instrument data, and other electronic data files. Field instruments and tools such as digital cameras, GPS units, water-quality meters, photoionization detectors (PIDs), pressure-transducers, dust monitors and hand-held computers store data in electronic formats that can be later downloaded and stored electronically for future reference. Take care when retrieving, storing, and managing these electronic data. The Project Manager or designee will be consulted for electronic data management instruction before using unfamiliar electronic instrument or tool requiring electronic data retrieval and storage. At minimum, Electronic Data Documents will be managed as suggested below:

- Download electronic data without manipulation. Downloaded data should be in a format that can be reviewed by others that may not have the equipment specific software used to download it.
- After collection, retrieve (download) electronic data from the field instrument daily or as determined necessary by the Project Manager.

- After successful electronic data document retrieval, store electronic data files at a digital location specifically reserved for that data document type. The data storage device must be reliable and secure. The data will be stored at a location that can be readily accessed by multiple team members (that is, network project server or file transfer protocol [FTP] site).
- Back up electronic data documents in the event of data loss. Backup formats may include, but are not limited to, CDs, DVDs and external hard drives. Whatever data backup format is used, the data backup must be managed for retrieval by the Project Manager and other responsible team members, if necessary.
- Name data files appropriately to easily identify the content and date of collection or download.
- If possible, include the following identifying information in data files:
 - Company name (C.T. Male Associates).
 - Client and project name.
 - Investigation area name.
 - Date and time.
 - Project number.
 - Location(s) of data collection.
 - Other information unique to the kind of data collected.
- Delete data from electronic instrument once successful download is confirmed. This is especially important if equipment is rented, so project data is not available to others not involved with the project.

7.0 Document Control

At the conclusion of a task or when field logs, datasheets, and/or electronic data documents have been completed, they will be submitted for records retention. Project files will be maintained by the Project Manager or designee. Documents will be kept in the project files and C.T. Male Associates electronic project directory. Project personnel may keep their own duplicate files; however, original documents will be placed in the official project file and scanned into the electronic project directory. Field logs of boring, sampling, and well installation activities will be maintained by the field sampling personnel and submitted to the project manager after the field effort.

8.0 Attachments

The following field forms are attached for reference:

- Environmental Services Field Log.
- Subsurface Exploration Log
- Geoprobe Subsurface Exploration Log.
- Test Pit Log Sheets.
- Organic Vapor Headspace Analysis Logs.
- Monitoring Well Construction Logs.
- Groundwater Services Field Log.
- Monitoring Well Water Level Logs.
- Monitoring Well Purging Logs.
- Monitoring Well Development Logs.



C.T. MALE ASSOCIATES ENGINEERING,
SURVEYING, ARCHITECTURE,
LANDSCAPE ARCHITECTURE &
GEOLOGY, D.P.C

STANDARD OPERATING PROCEDURE

ORGANIC VAPOR MONITORING and AIR MONITORING

March 6, 2020

Print Technical Reviewer Signature Date

Print QA Manager Signature Date

Review of the SOP has been preformed and the SOP still reflects the current practice			
Initials		Date	
Initials		Date	

SOP: ORGANIC VAPOR MONITORING AND AIR MONITORING

1.0 PURPOSE

This standard operating procedure (SOP) provides guidance for conducting organic vapor monitoring of environmental media, and air monitoring procedures to identify volatile organic compounds (VOCs) and airborne particulates (i.e., dust) during field activities. The project-specific Health and Safety Plan (HASP), submitted under separate cover, will specify the type(s) and frequency of vapor and air monitoring requirements at each work area.

2.0 SCOPE

- This SOP applies to C.T. Male Associates' personnel engaged in organic vapor or air monitoring activities.

There are many instruments available for organic vapor and air monitoring. This SOP focuses on the project-specific instruments and applications. Monitoring requirements that are not identified in this SOP will be discussed with the Site Health & Safety Officer before starting field activities, such that proper requirements, procedures, and monitoring instruments are identified. Should instrumentation or procedures be added to a project task that is not included in this SOP, they will be incorporated into the project-specific HASP and documented on the Environmental Services Field Log.

3.0 GENERAL

Organic vapor monitoring and air monitoring serve two primary functions:

1. To evaluate organic vapor concentrations in site media to assist site characterization.
2. To monitor potential airborne chemical contaminant exposures to C.T. Male Associates site workers and the surrounding community.

The use of field instrumentation for volatile organic compounds (VOCs) at field sites allows on-site analytical screening of air, water, sediment, and soils. Screening results can also be used to anticipate potential petroleum and other VOC contamination and

select locations for sample collection for laboratory analysis. In addition to monitoring for VOCs during sample collection, air monitoring for VOCs and airborne particulates may be necessary to identify potentially hazardous atmospheres encountered during field activities which may affect site personnel and/or the surrounding community.

Air screening measurements can be used to evaluate the exposure risk and be used as a basis for setting health and safety levels of protection. Instrument calibration and air monitoring should be conducted according to, and at the frequency specified in, the approved project-specific HASP. Air monitoring instruments will be calibrated daily and/or as specified by the instrument manufacturer, before obtaining measurements. Air monitoring results compared to specifications in the project-specific HASP provide documentation that overexposure has not occurred, compliance with standards has been achieved, and most importantly, the real-time determination of whether engineering controls or personal protective equipment (PPE) are needed to control exposure.

4.0 RESPONSIBILITIES

4.1 Project Manager

The Project Manager is responsible for providing adequate resources, and verifying that field staff has adequate experience and training for project-specific implementation of the health, safety, and environment (HS&E) management process and project SOPs. The Project Manager is also responsible for identifying the need for organic vapor monitoring or the potential for hazardous atmospheres during the planning stages of the project. In addition, the Project Manager is responsible for developing or authorizing alternative monitoring requirements if notified that conditions encountered in the field have changed from those identified in the HASP.

The Project Manager and Health & Safety Officer cooperatively have overall HS&E program responsibility; however, specific tasks may be delegated to other project staff. The Project Manager retains ultimate HS&E responsibility for the project.

4.2 Health & Safety Officer

The Health & Safety Officer is responsible for verifying that organic vapor and air monitoring is conducted according to the project-specific HASP. The Health & Safety Officer and a designated Field Sampling Leader supervise the collection and documentation of field data generated, and verifies that the equipment used by the field sampling personnel is calibrated at the appropriate frequency and maintained correctly.

4.3 Site Health and Safety Officer

The role of Site Health and Safety Officer is delegated to the Field Team Leader by the Project Manager to assist in implementing the project HASP. The Project Manager and/or Health & Safety Officer assists the Site Health and Safety Office /Field Team Leader with the health and safety program, implements the PPE requirements described in the project HASP and receives input from project staff that the assigned PPE requirements and on-going HS&E procedures are effective.

4.4 Field Sampling Leader

The Field Sampling Leader, in conjunction with the Health & Safety Officer, is responsible for overall compliance with this technical procedure. The Field Sampling Leader is responsible for following these procedures or delegating tasks to team members to perform vapor and air monitoring tasks.

5.0 PROCEDURES

Many instruments are available for organic vapor monitoring, as well as monitoring of airborne dust. Because it is beyond the scope of this SOP to describe available alternatives, this SOP will focus on conducting air monitoring and headspace soil vapor monitoring using the following commonly used equipment types:

- Photoionization detector (PID)
- Flame Ionization detector (FID)
- Combustible gas indicator (CGI) and oxygen level indicator
- Combination Meters and Multi -gas meters (such as PID, CGI, oxygen, and hydrogen sulfide)
- Dust monitor

The organic vapor and air monitoring instruments expected to be used include the following:

- MiniRae 2000 or 3000 PID
- Photovac Micro FID
- Thermo Scientific TVA 1000A FID/PID
- MultiRae Plus Multi-gas meter
- RKI Eagle 6
- DustTrak™ II Aerosol Monitor (Model 8530).

The MiniRae 3000 PID is the commonly used instruments for organic vapor monitoring. The DustTrak™ II Aerosol Monitor is a direct-reading, aerosol monitor designed to provide real-time measurement of airborne dust and particulate concentrations.

5.1 Equipment Calibration

To ensure that field air monitoring equipment will be calibrated and remain operable in the field, calibrate field air monitoring equipment daily, or per the manufacturer's recommendation, before use. Other project-specific requirements may require calibration of air monitoring equipment at a greater frequency. Calibrate field air monitoring equipment on site and document that calibration standards used meet the minimum requirements for source and purity recommended by the instrument manufacturer. PIDs and FIDs are typically calibrated with a 100 parts per million (ppm) isobutylene calibration gas. The PID or FID must be capable of ionizing the expected contaminants of concern. Calibrate field air monitoring equipment within calibration acceptance criteria and within the instruments operational limits (zero calibration for the dust monitor equipment). If instrument readings appear to be irregular or drifting, recalibrate instruments before collecting additional data. Flag apparent instrument drift or erratic instrument readings on Environmental Services Field Logs (see SOP Note Taking and Field Logs). If the instrument cannot be recalibrated, take the instrument out of service and replace it with a different unit that is capable of being calibrated and used with reliability.

Before starting air monitoring, document the following calibration information on the Environmental Services Field Log and Organic Vapor Headspace Analysis Log:

- Calibration Date and Time.
- Instrument Type, Name, Serial Number, and Owner.
- Lamp Type (PID only).
- Calibration gas type, canister lot number, and expiration date.
- Zero gas calibration reading, if used.
- Calibration gas (span gas) reading.
- Zero filter calibration reading (dust monitor).
- Ambient weather condition (for example, temperature and wind direction).
- Operator's initials.
- Other notes and comments.

5.2 Organic Vapor Monitoring with a Photoionization Detector

The following procedures are specific to the MiniRae 3000 PID instrument; however, they are generally applicable to other manufacturer's instruments, and the precautions to consider are the same. Manufacturer specific manuals should be reviewed and understood before instrument use.

The MiniRAE 3000 PID is a portable, non-specific vapor/gas detector employing the principle of photoionization to detect a wide variety of VOCs. Use a PID during intrusive activities (i.e., test borings, soil excavation, etc.) where there is a potential for the presence of petroleum or VOC contamination in accordance with the project-specific HASP.

Calibrate the PID each day, following the calibration specifications of the manufacturer and before the start of field activities. If the PID is in continuous operation, verify daily

calibration with a bump test. Perform instrument calibration using isobutylene calibration gas of known concentration; 100 ppm isobutylene calibration gas is preferred.

The following provide additional details about the PID:

- The MiniRae 3000 PID is reported to operate continuously for up to 16 hours before requiring battery recharging, but charging on a daily basis is preferred.
- Elevated water vapor concentrations experienced in high humidity will foul the PID and may result in erroneous readings. If high humidity problems persist, blow-dry the sensor module or bring instrument into an air conditioned environment with reduced humidity.
- MiniRAE 3000 PID readings are relative to the calibration gas. After calibration with 100 ppm isobutylene, the MiniRAE 3000 PID will respond directly in units equivalent to isobutylene.
- Most VOCs will be detected by the MiniRAE 3000 PID. However, it cannot distinguish between isobutylene and other ionizable compounds. A reading of 10 ppm indicates ionizable compounds that are present have generated an ion current equivalent to 10 ppm of isobutylene. The reading is actually 10 ppm isobutylene equivalent units.
- The lamp window must be periodically cleaned according to the instructions in the manual provided with the instrument to maintain ionization of the volatilized contaminants.

5.2.1 Organic Vapor Monitoring of Site Media

Monitoring of organic vapors in site media can help identify potentially contaminated areas to assist with site characterization. Organic vapor monitoring is typically conducted using a PID or FID for analytical screening of soil by screening soil cores, test pits, or soil headspace. The PID or FID can also be used to evaluate organic vapors inside monitoring wells and excavations.

For volatile and semi-volatile compounds, knowing the photoionization potential (PIP) is necessary in determining the appropriate instrument to use when conducting organic vapor screening. Review the QAPP and manufacturer's manual to determine that the proper instrument has been selected for the contaminate vapors of interest. A 10.6 eV lamp may be used if expected compounds have a PIP less than or equal to 10.6 eV. If an expected compound at a site has a PIP less than or equal to 11.7 electron volts (eV), it is possible to use a PID equipped with an 11.7 eV lamp. If the ionization potential is great than 11.7 eV, and FID is preferred.

Perform operation, maintenance, and calibration according to the manufacturer's specifications and this SOP. Document results of instrument calibrations on the Environmental Services Field Logs.

5.2.2 Soil Core Screening for Organic Vapors

Soil cores are typically obtained during drilling activities and should be screened for the presence of organic vapors using a PID or FID. Immediately following extraction and opening of a lithologic core sample during drilling, screen the core by slowly passing the tip of the PID or FID along the lithologic core (very close to the core, but not touching it). Record readings along the soil core in 2 foot increments and additionally target zones of high odor or staining. Record readings on the Organic Vapor Headspace Analysis Log.

5.2.3 Test Pit Soil Screening for Organic Vapors

Surface soil, newly exposed soil, soil stockpiles, and excavation surfaces can be screened for the presence of organic vapors using a PID or FID. Before screening newly exposed soil, soil stockpiles, and excavation surfaces, dig a sample test pit at least 6 inches deep into the soil using a clean, decontaminated sampling tool such as a stainless-steel spoon and/or shovel. For surface soil or other soil directly exposed to the atmosphere for greater than 1 hour, dig an at least 18-inch test pit before soil screening. Observe soil screening from freshly exposed soil. When digging, minimize the diameter of the test pit, if possible, to reduce advection of soil vapors out of the test pit. Immediately following digging, insert the sample tip of the PID or FID into the test pit, approximately 1 to 2 inches from the bottom of the test pit, taking care not to foul the sample tip with soil particulates or uptake water droplets.

Use of a particulate/moisture filter is recommended. Record the maximum detector reading as the final sample concentration on the Organic Vapor Headspace Analysis Log.

5.2.4 Soil Headspace Screening for Organic Vapors

Headspace organic vapor monitoring involves the measurement of organic vapors emitted from soil samples in a sealed container. The headspace of the container is typically warmed and then tested for volatile organic vapors using a PID or FID. The results generated by this method are qualitative to semi-quantitative and are limited to organic compounds that readily volatilize. Soil can be collected for headspace screening from various sources including lithologic soil cores during drilling, soil stockpiles, or from excavations and test pits. For soil cores, soil headspace should be screened from 2-foot intervals at zones of where contamination is expected.

The following procedures may be followed when conducting soil headspace screening for organic vapors:

- Calibrate the headspace screening instrument(s) according to the manufacturer's specifications.
- Headspace screening will typically be analyzed using clean, re-sealable 1-quart Zip-loc™ (or similar) plastic bags. Bags are not to be reused.
- To begin collection of headspace screening samples, collect a small amount of soil (about the equivalent of a softball) and immediately place it inside a clean, re-sealable 1-quart Ziploc™ (or similar) plastic bag until the plastic bag is about one-third to one-half full; then immediately seal the bag completely. Larger plastic bags should not be used to prevent vapor diffusion and stratification effects that may significantly affect the sample. Samples from soil cores, excavations, or soil piles must be immediately transferred into the sample bag once the soil core is opened, or the soil sample is uncovered and exposed to the atmosphere.

- Shake the bag for 15 seconds and let it rest for at least 10 minutes but no longer than one hour. The temperature of the headspace must be warmed to at least 40 degrees Fahrenheit (°F) (5 degrees Celsius [°C]) before testing. If the soil and/or outdoor temperature is below 40°F, placing the headspace sample in a warm location at approximately room temperature (that is, indoors) may be necessary to slowly warm the sample to an acceptable temperature.
- Before testing, shake the bag for another 15 seconds to further assist volatilization.
- Insert the sample tip of the PID or FID into the bag at a point approximately one-half the headspace depth, taking care not to foul the sample tip with soil particulates or uptake water droplets. The sample bag insertion opening must be minimized to reduce the potential for vapors from escaping. The bag opening can be made with the probe tip.
- After probe insertion, record the maximum detector reading as the final sample concentration on the Organic Vapor Headspace Analysis Log. The maximum detector reading normally occurs between 2 and 5 seconds after probe insertion, but if reading is rapidly climbing, wait longer.
- If erratic instrument response occurs at high VOC concentrations or conditions of elevated headspace moisture are realized, record the instrument behavior along with the maximum detected reading(s). Under these conditions, headspace data may be discounted.

5.2.5 Screening for Organic Vapors in the Monitoring Well Casing

When conducting groundwater monitoring and/or sampling, the air inside the monitoring well casing will be screened for organic vapors using a PID. To screen for organic vapors inside or exiting the monitoring well casing, stand next to and not over the well approximately arms reach away from the well. Slowly open the well cap and immediately check for organic vapors in the well casing by positioning the tip of the PID at the top of the open well casing. Record this reading on the Groundwater Services Field Log.

5.3 Air Monitoring for Potential Contaminant Exposure

Air monitoring for potential exposure to airborne contaminants is typically conducted using a PID, FID, CGI (measuring oxygen level and explosive atmosphere), MultiRae Plus meter (measuring oxygen level, explosive atmosphere, PID, and hydrogen sulfide), or dust/aerosol meter. Air monitoring is typically conducted at one or more of the following areas for the reasons given below:

- At the source. Monitoring at this location gives a worst-case assessment of the situation. If concentrations at the source are below the action levels, then a potential exposure problem is unlikely.
- In the employee breathing zone. Monitoring should be conducted in the employees' breathing zones to determine the actual conditions that they may potentially be exposed to. Since employees doing different tasks may have different potential exposures, monitoring should be conducted for the worst case scenario for each task.
- At the perimeter. Perimeter monitoring is used to document background condition and that the surrounding community is not being adversely affected by the operations. This type of monitoring is typically warranted as a means of documenting that no off site releases occur.
- Conduct monitoring before entering a potentially hazardous area, according to requirements in the project-specific HASP.

5.3.1 Monitoring of Oxygen, Combustible, Hydrogen Sulfide Gas, and Airborne Particulates

Instruments typically used to monitor oxygen levels, combustible atmosphere, hydrogen sulfide, or airborne dust include the MultiRAE plus meter (measuring oxygen level, explosive atmosphere, PID, and hydrogen sulfide), CGI (measuring oxygen level and explosive atmosphere), or dust/aerosol meter.

Depending on the requirements in the site specific HASP; oxygen, combustible, hydrogen sulfide gas, and airborne dust measurements may be made during field activities to ensure that breathing atmospheres do not become hazardous.

Entry into any confined space or any other area where hazardous atmospheres may possibly be a concern must be conducted under direct consultation with the site specific HASP and work plan. Always consult the project PM and/or OHSM with any questions or concerns regarding instrument monitoring and work situations involving confined spaces and/or potentially hazardous atmospheres.

5.3.2 Monitoring of Oxygen Level

The oxygen level in a confined space or other area of little to no air circulation is of prime concern to anyone about to enter that space. Removal of oxygen by combustion, reduction reactions, or displacement by other gases or vapors may be a hazard. Likewise, elevated levels of combustible or toxic gases may also pose a hazard to health. Elevated levels of oxygen may also result in an explosive hazard.

MultiRAE Plus meters are commonly used to monitor oxygen levels. Perform operation, maintenance, and calibration of oxygen monitoring instruments according to the manufacturer specifications. Calibrate oxygen monitoring instruments before starting work each day. Document the calibration check on the Field Calibration Sheet.

Because some instruments do not operate properly without sufficient oxygen and others can cause explosions, the monitoring of oxygen will be the initial concern when working in an environment where there is potential for oxygen levels to be below 19.5% or greater than 23%. The normal oxygen concentration at sea level is 21%.

5.3.3 Monitoring for Explosive Atmosphere

The MultiRAE Plus meter is commonly used to monitor for a flammable and explosive atmosphere. Perform operation, maintenance, and calibration of explosive atmosphere monitoring instruments according to the manufacturer specifications.

Calibrate explosive atmosphere monitoring instruments before starting work each day. Document the calibration check on the Field Calibration Sheet.

Conduct monitoring for flammable or explosive environments at the same locations as monitoring of oxygen levels. Work can proceed as normal if the air conditions are less than 10% of the LEL. If the air conditions are greater than 10% of the LEL or methane gas is less than 5% LEL, work is to stop immediately. Evacuate the site or implement engineering controls to reduce the LEL to acceptable levels.

5.3.4 Monitoring for Toxic Gases

The MultiRAE plus meter and Drager colorimetric tubes are commonly used to monitor for toxic gases. Perform operation, maintenance, and calibration of toxic gas monitoring instruments according to the manufacturer specifications and the HSP. Calibrate or inspect toxic monitoring instruments (as required) before starting work each day. Document the calibration check on the Field Calibration Sheet.

Toxic gases include organic and inorganic vapors and gases. The MultiRAE Plus meter is capable of monitoring the odorless and colorless toxic gas hydrogen sulfide, which is a common gas found at contaminated sites.

5.3.5 Monitoring of Airborne Particulates (Dust)

The instrument that should be used to measure airborne dust is the DustTrak™ II Aerosol Monitor (Model 8530). The monitor will be used during ground intrusive activities and is capable of measuring airborne particulate (dust) concentrations at the perimeter of the work area for protection of site workers and the surrounding community. . The aerosol monitor meter is typically used to monitor for airborne aerosol particles and dust. Perform operation, maintenance, and calibration of airborne dust monitoring instruments according to the manufacturer specifications and the project-specific HASP. Calibrate airborne dust monitoring instruments (as required) before starting work each day. Document the calibration check on the Environmental Services Field Log.

Non-volatile contaminants (such as metals or polychlorinated biphenyls [PCBs]) can become airborne as particulates and typically require monitoring at sites where

there is a potential for dusty environments. Total dust action levels are discussed in the project-specific HASP.

6.0 RECORDS

Record PID field measurements on the Environmental Services Field Logs. Dust monitoring data is recorded electronically and is downloaded and stored in electronic format in C.T. Male Associates' project directory.

7.0 DEFINITIONS

- Combustible Gas Indicator (CGI): used to screen for flammable and explosive vapors and gases. Often combined with an oxygen level indicator.
- Continuing calibration verification: an analytical standard run periodically to verify the calibration of an instrument.
- Flame Ionization Detector (FID): detects organic gases and vapors. Determines relative total concentration of selected organic air contaminants, which is used to specify engineering controls and PPE requirements.
- Headspace Gases: The accumulated gaseous components found above solid or liquid layers in closed vessels.
- Initial Calibration: Analysis of standard gases at a series of different specified concentrations; used to define the linearity and dynamic range of the response of an instrument to the target compounds.
- Photoionization detector (PID): Detects total concentrations of many organic and some inorganic gases and vapors. Molecules are ionized using ultraviolet radiation. A current is produced in proportion to the number of ions present.
- Photoionization Potential (PIP): The potential difference through which a bound electron must be raised to free it from the atom or molecule to which it is attached. In particular, the ionization potential is the difference between the initial state, in which the electron is bound, and the final state, in which it is at rest at an indefinite distance from the molecule.

- Volatile Organic Compounds (VOCs): Organic compounds that evaporate when exposed to air (>100 millimeters of mercury [mm Hg]).

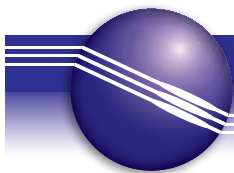
8.0 ATTACHMENTS

Attachment 1: MiniRae 3000 PID Specification Sheet.

Attachment 2: DustTrak™ II Aerosol Monitor (Model 8530) Specification Sheet.

ATTACHEMNT 1

MiNiRae 3000 PID SPECIFICATION SHEET



MiniRAE 3000

Portable Handheld VOC Monitor

The MiniRAE 3000 is the most advanced handheld volatile organic compound (VOC) monitor on the market. Its photoionization detector's (PID) extended range of **0 to 15,000 ppm** makes it an ideal instrument for applications from industrial hygiene to leak detection and HazMat.

The **RF modem allows real-time data transmissions** with a base controller located up to 500 feet away from the MiniRAE 3000 (or two miles with optional RAELink3 portable modem). A personal computer can be used as the base station for a MiniRAE 3000 system. The standard ProRAE Remote software is capable of monitoring the input of up to 64 remotely located monitors, including MiniRAE 3000, AreaRAE, etc.



Key Features

- **Proven PID technology**

The patented sensor provides the following unique features:

- 3-second response time
- Extended range up to 15,000 ppm with improved linearity
- Humidity compensation with integral humidity and temperature sensors

- **Real-time wireless data transmission** with built-in RF modem or Bluetooth

- **Designed for simple service** Easy access to lamp and sensor in seconds without tools

- **Big graphic display** for easy overview of gas type, Correction Factor and concentration

- **Field-interchangeable battery pack** replaced in seconds without tools

- **Integrated flashlight** for better view in dark conditions

- **User-friendly screens, including dataplot chart view**

- **Integrated RAE Systems Correction Factors list for more than 200 compounds** to measure more chemicals than any other PID

- **Multi-language support** with 12 languages encoded

- **Rugged housing** withstands use in harsh environments

- IP67 waterproof design for easy cleaning and decontamination in water
- Strong protective removable rubber boot

Additional Advantages

- View real-time sensor data and alarm status at headquarters or command center
- Automatic lamp type recognition
- Duty-cycling™ lamp and sensor auto-cleaning technology
- Tough, flexible inlet Flexi-Probe™
- 3 large keys operable with 3 layers of gloves
- Strong, built-in sample pump draws up to 100 feet (30m) horizontally or vertically
- Loud, 95dB audible alarm
- Bright red flashing visual alarm
- Interchangeable drop-in Lithium-Ion and alkaline battery packs
- Charging cradle doubles as an external battery charger
- Compatible with AutoRAE™ calibration station
- ProRAE Remote software simultaneously controls and displays readings for up to 64 remote detectors
- License-free, ISM band RF transmission with communication range up to 500 feet (2 miles with optional RAELink3 modem)
- Optional RAELink3 modem provides GPS capability to track and display readings from remote detectors and provide up to 2 miles' long-distance transmission
- Datalogging with up to 6 months of data at one-minute intervals
- 3-year 10.6 eV lamp warranty



Wireless



**AutoRAE
Compatible**

MiniRAE 3000

Specifications*

Detector Specifications

Size	10" L x 3.0" W x 2.5" H (25.5 cm x 7.6 cm x 6.4 cm)
Weight	26 oz (738 g)
Sensors	Photoionization sensor with standard 10.6 eV or optional 9.8 eV or 11.7 eV lamps
Battery	<ul style="list-style-type: none"> • Rechargeable, external field-replaceable Lithium-Ion battery pack • Alkaline battery adapter
Operating Hours	16 hours of operation (12 hours with alkaline battery)
Display Graphic	4 lines, 28 x 43 mm, with LED backlight for enhanced display readability
Keypad	1 operation and 2 programming keys, 1 flashlight on/off
Direct Readout	Instantaneous reading <ul style="list-style-type: none"> • VOCs as ppm by volume • High values • STEL and TWA • Battery and shutdown voltage • Date, time, temperature
Alarms	95dB at 12" (30 cm) buzzer and flashing red LED to indicate exceeded preset limits <ul style="list-style-type: none"> • High: 3 beeps and flashes per second • Low: 2 beeps and flashes per second • STEL and TWA: 1 beep and flash per second • Alarms latching with manual override or automatic reset • Additional diagnostic alarm and display message for low battery and pump stall
EMI/RFI	Highly resistant to EMI/RFI. Compliant with EMC directive (2004/108/EC); R & TTE directive (1999/5/EC)
IP Rating	<ul style="list-style-type: none"> • IP67 unit off and without flexible probe • IP65 unit running
Datalogging	Standard 6 months at one-minute intervals
Calibration	Two-point or three-point calibration for zero and span. Calibration memory for 8 calibration gases, alarm limits, span values and calibration dates
Sampling Pump	<ul style="list-style-type: none"> • Internal, integrated flow rate at 500 cc/mn • Sample from 100' (30m) horizontally and vertically
Low Flow Alarm	• Auto pump shutoff at low-flow condition
Communication	<ul style="list-style-type: none"> • Download data and upload instrument set-up from PC through charging cradle or optional Bluetooth™ • Wireless data transmission through built-in RF modem
Frequency	902 to 928 MHz (license-free), 2.400 to 2.4835 GHz (license-free), 433 MHz, 869 MHz
RF Range	Up to 500' (152m; 900 MHz, 433 Mhz, 869 Mhz), extendable with RAELink3 Repeater to 2 miles (3.2km)
Hazard Area Approval	<ul style="list-style-type: none"> • US and Canada: c^{us}, Classified as Intrinsically Safe for use in Class I, Division 1 Groups A, B, C, D • Europe: ATEX II 2G EEx ia IIC T4
Temperature	-4° to 122° F (-20° to 50° C)
Humidity	0% to 95% relative humidity (non-condensing)
Attachments	Durable bright yellow rubber boot
Warranty	3 years for 10.6 eV lamp, 1 year for pump, battery, sensor and instrument

*Specifications are subject to change

Sensor Specifications

Gas Monitor	Range	Resolution	Response Time T90
VOCs	0 to 999.9 ppm 1000 to 15,000 ppm	0.1 ppm 1 ppm	< 3 s < 3 s

Monitor only includes:

- MiniRAE 3000 Monitor, Model PGM-7320
- Wireless communication module built in, as specified
- Datalogging with ProRAE Studio Package for Windows™ 98, 2000, NT, ME & XP
- Charging/download adapter
- RAE UV lamp, as specified
- Flex-I-Probe™
- External filter
- Rubber boot
- Alkaline battery adapter
- Lamp-cleaning kit
- Tool kit
- Operation CD-ROM
- Operation & Maintenance manual
- Soft leather case

Monitor with accessories kit adds:

- Hard transport case with pre-cut foam padding
- Charging/download cradle
- 5 Porous metal filters and O-rings
- Organic vapor zeroing kit
- Gas outlet port adapter and tubing

Optional calibration kit adds:

- 100 ppm isobutylene calibration gas, 34L
- Calibration regulator and flow controller

Optional Guaranteed Cost of Ownership Program:

- 4-year repair and replacement guarantee
- Annual maintenance service

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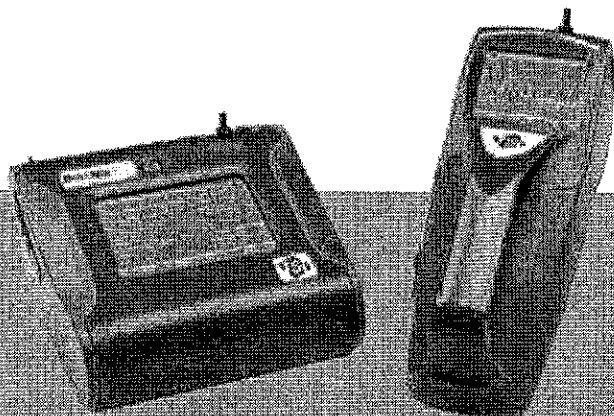
ATTACHEMNT 2

DustTrak™ ii Aerosol Monitor (Model 8530) Specification Sheet

DUSTTRAK™ II AEROSOL MONITORS MODELS 8530, 8530EP AND 8532

DESKTOP OR HANDHELD
UNITS FOR ANY ENVIRONMENT,
ANY APPLICATION

DustTrak™ II Aerosol Monitors are battery-operated, data-logging, light-scattering laser photometers that give you real-time aerosol mass readings. They use a sheath air system that isolates the aerosol in the optics chamber to keep the optics clean for improved reliability and low maintenance. From desktop and desktop with external pump models to a handheld model, the DustTrak II offers a suitable solution for harsh industrial workplaces, construction and environmental sites and other outdoor applications, as well as clean office settings. The DustTrak II monitors measure aerosol contaminants such as dust, smoke, fumes and mists.



Features and Benefits

All Models

- + Real-time mass concentration readings and data-logging allow for data analysis during and after sampling
- + Measure aerosol concentrations corresponding to PM1, PM2.5, Respirable, and PM10 size fractions, using a variety of inlet conditioners
- + Easy-to-use graphical user interface with color touch-screen for effortless operation

Handheld Model (8532)

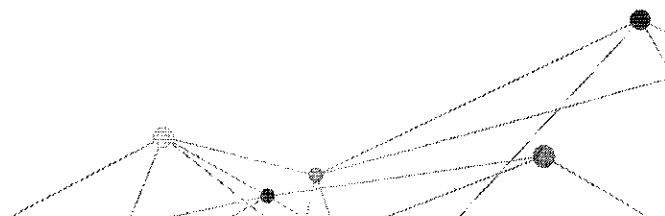
- + Long life internal pump for continuous sampling
- + Single-point data collection for walk through surveys
- + Lightweight design with ergonomic handle for portable applications

Desktop Models (8530 and 8530EP)

- + Energy-efficient, long lasting external pump for continuous, unattended, 24/7, outdoor monitoring applications (Model 8530EP only)
- + Long life internal pump for shorter work-shift or IAQ sampling applications (Model 8530)
- + Gravimetric reference sampling capability for custom reference calibrations
- + Automatic zeroing (with optional zero module) to minimize the effect of zero drift
- + STEL alarm setpoint for tracking 15-minute average mass concentrations
- + Environmental protected and tamper-proof secure (with an optional environmental enclosure)
- + Inlet sample conditioning (with optional heated inlet sample conditioner) to reduce the effect of humidity on photometric mass measurements (for use with an environmental enclosure)
- + Cloud Data Management System as hosted by Netronix™



UNDERSTANDING, ACCELERATED



Desktop Models: Ideal for Long-Term Surveys and Remote Monitoring Applications

The DustTrak II is offered as a standard desktop (Model 8530), as well as a desktop with external pump (Model 8530EP.) Both models have manual and programmable data logging functions, making them ideal for unattended applications. The standard desktop model is most suitable for indoor, continuous monitoring, while the desktop with external pump is designed for 24/7 unattended, remote monitoring outdoors.

The DustTrak II desktop models come with USB (device and host), Ethernet, and analog and alarm outputs allowing remote access to data. User adjustable alarm setpoints for instantaneous or 15-minute short-term excursion limit (STEL) are also available on desktop models. The alarm output with user-defined setpoint alerts you when upset or changing conditions occur.

The DustTrak II desktop monitors have several unique features:

- + Measure aerosols in high concentrations up to 400 mg/m³.
- + External pump (Model 8530EP) with low power consumption for continuous, unattended monitoring in remote outdoor locations.
- + Gravimetric sampling capability using a 37-mm filter cassette which can be inserted in-line with the aerosol stream allowing you to perform an integral gravimetric analysis for custom reference calibrations.
- + Zeros automatically using the external zeroing module. This optional accessory is used when sampling over extended periods of time. By zeroing the monitor during sampling, the effect of zero drift is minimized.
- + STEL alarm feature for tracking 15-minute average mass concentrations when alarm setpoint has been reached for applications like monitoring fugitive emissions at hazardous waste sites.
- + Provide for environmental protection and tamper-proof security using an environmental enclosure. This optional accessory encloses the instrument within a waterproof, lockable, custom-designed case.
- + Condition the sample air stream before entering the instrument optics using a heated inlet sample conditioner (designed for use with an environmental enclosure.) This optional accessory is used in humid environments. By conditioning the sample, the humidity and water vapor are minimized, reducing elevated measurements.

Handheld Models: Perfect for Walk-Through Surveys and Single-Point Data Collection Applications

The DustTrak II Handheld Model 8532 is lightweight and portable. It is perfect for industrial hygiene surveys, point source location monitoring, indoor air quality investigations, engineering control evaluations/validation, and for baseline trending and screening. Like the desktop models, it has manual and programmable data logging functions. In addition, the handheld model also has a single-point data logging capability. Single-point data collection is used for walk-through industrial hygiene surveys and indoor air quality investigations.

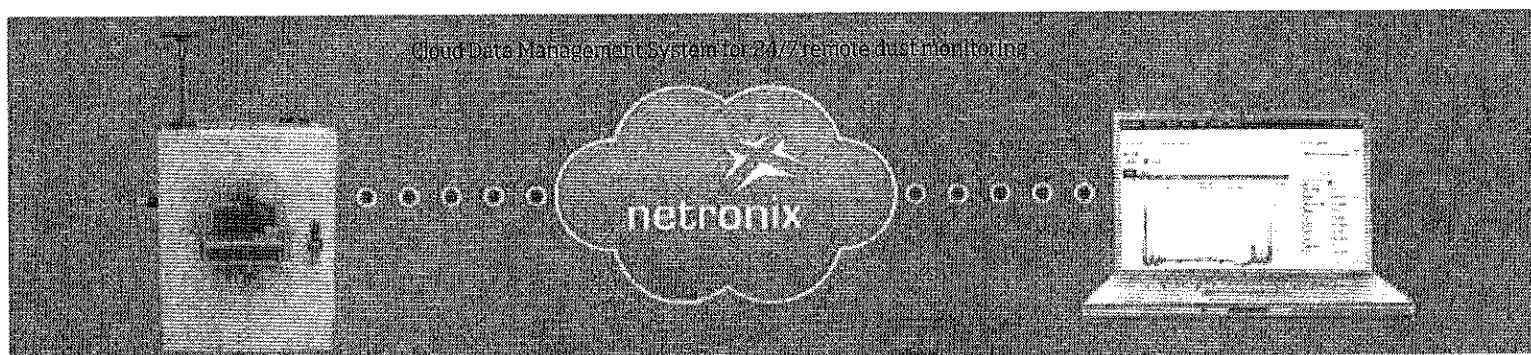
Applications	Desktop	Handheld
Aerosol research studies	+	+
Baseline trending and screening	+	+
Engineering control evaluations		+
Engineering studies		+
Epidemiology studies	+	+
Indoor air quality investigations	+	+
Industrial/occupational hygiene surveys	+	+
Point source monitoring		+
Outdoor environmental monitoring	+	
Process monitoring	+	+
Remote monitoring	+	

Battery Performance

Models 8530 and 8530EP (Typical) 6600 mAh Li-Ion Battery Pack (P/N 801680)	1 Battery	2 Batteries
Battery runtime (hours)	Up to 6	Up to 12
Charge time* (hours) in DustTrak	4	8
Charge time* (hours) in external battery charger (P/N 801685)	4	8

Model 8532 (Typical) 3600 mAh Li-Ion Battery Pack (P/N 801681)	Battery
Battery runtime (hours)	Up to 6
Charge time* (hours) in DustTrak	4
Charge time* (hours) in external battery charger (P/N 801686)	4

* Of a fully depleted battery



DustTrak II Aerosol Monitor Features

All Models

- + Li-Ion rechargeable batteries
- + Internal and external battery charging capabilities
- + Outlet port for isokinetic sampling applications
- + User serviceable sheath flow and pump filters
- + Logged test pause and restart feature
- + Logged test programming
 - + Color touch screen—either manual mode or program mode
 - + TrakPro™ Data Analysis Software via a PC
- + User adjustable custom calibration settings
- + Instantaneous alarm settings with visual and audible warnings
- + Real-time graph display
- + View statistical information during and after sampling
- + On-screen instrument status indicators:
FLOW, LASER and FILTER
- + Filter service indicator for user preventative maintenance

Desktop Models (8530 and 8530EP)

- + Long life external pump (8530EP)
- + Internal pump (8530)
- + Hot swappable batteries
- + Gravimetric reference sample capability
- + STEL alarm setpoint

Optional Accessories

- + Auto zeroing module
- + Protective environmental enclosure (8535 and 8537)
- + Heated inlet sample conditioner (for use with an environmental enclosure)
- + Cloud Data Management System as hosted by Netronix™

Handheld Model (8532)

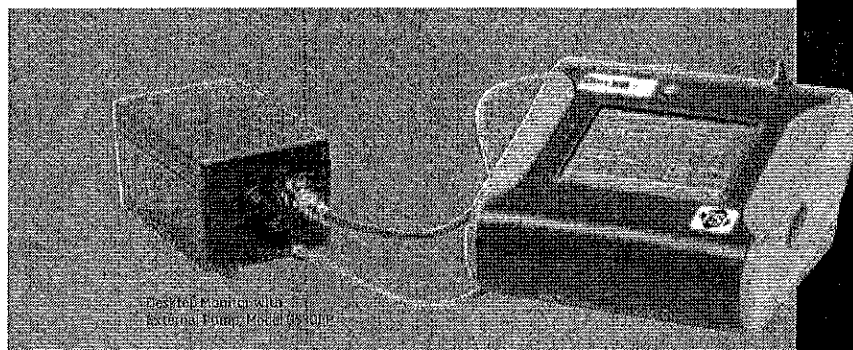
- + Long life internal pump
- + Single-point data collection for walk through surveys

Easy to Program and Operate

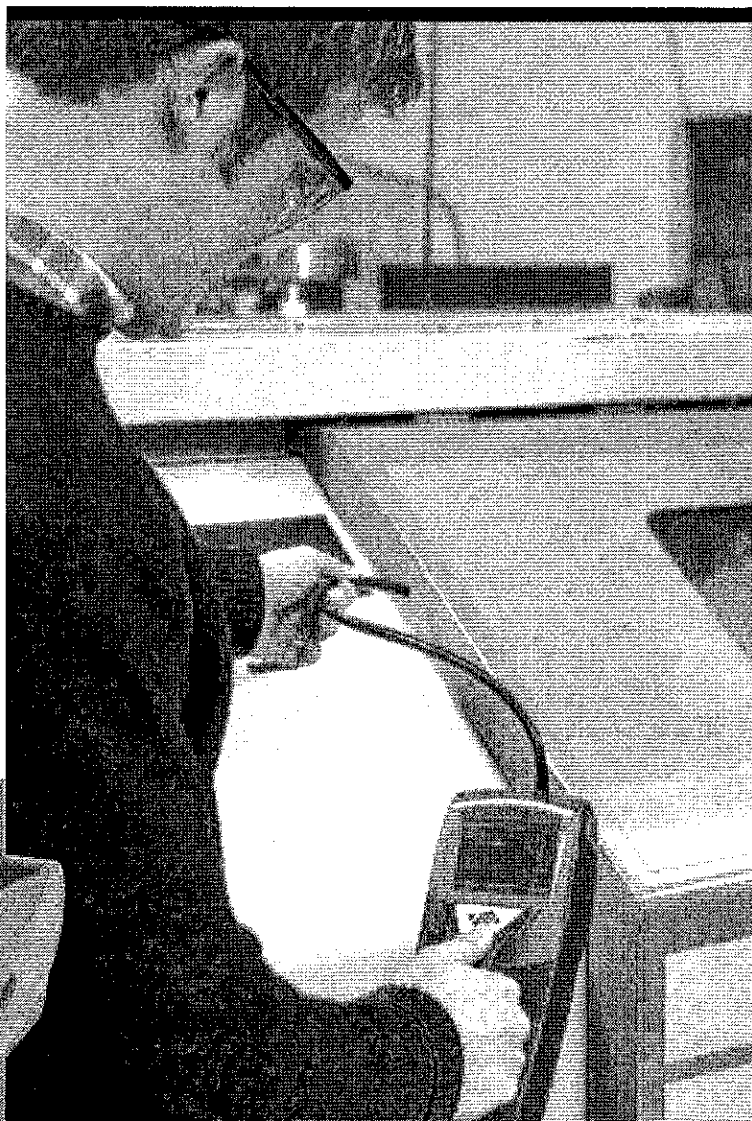
The graphical user interface with color touch-screen puts everything at your fingertips. The easy-to-read display shows real-time mass concentration and graphical data, as well as other statistical information along with instrument pump, laser and flow status, and much more. Perform quick walk-through surveys or program the instrument's advanced logging modes for long-term sampling investigations. Program start times, total sampling times, logging intervals, alarm setpoints and many other parameters. You can even set up the instrument for continuous unattended operation.

TrakPro™ Software Makes Monitoring Easier than Ever

TrakPro™ Data Analysis Software allows you to set up and program directly from a PC. It even features the ability for remote programming and data acquisition from your PC via wireless communication options or over an Ethernet network. As always, you can print graphs, raw data tables, and statistical and comprehensive reports for record keeping purposes.



DustTrak II Monitor with
External Pump, Model 8530EP



SPECIFICATIONS

DUSTTRAK™ II AEROSOL MONITORS MODELS 8530, 8530EP AND 8532

Sensor Type

90° light scattering

Particle Size Range

0.1 to 10 µm

Aerosol Concentration Range

8530 Desktop	0.001 to 400 mg/m³
8530EP Desktop with External Pump	0.001 to 400 mg/m³
8532 Handheld	0.001 to 150 mg/m³

Resolution

±0.1% of reading or 0.001 mg/m³, whichever is greater

Zero Stability

±0.002 mg/m³ per 24 hours at 10 sec time constant

Flow Rate

3.0 L/min set at factory, 1.40 to 3.0 L/min, user adjustable

Flow Accuracy

±5% of factory set point, internal flow controlled

Temperature Coefficient

+0.001 mg/m³ per °C

Operational Temp

32 to 120°F (0 to 50°C)

Storage Temp

-4 to 140°F (-20 to 60°C)

Operational Humidity

0 to 95% RH, non-condensing

Time Constant

User adjustable, 1 to 60 seconds

Data Logging

5 MB of on-board memory (>60,000 data points)
45 days at 1 minute logging interval

Log Interval

User adjustable, 1 second to 1 hour

Physical Size (H x W x D)

Handheld	4.9 x 4.8 x 12.5 in. (12.5 x 12.1 x 31.6 cm)
Desktop	5.3 x 8.5 x 8.8 in. (13.5 x 21.6 x 22.4 cm)
External Pump	4.0 x 7.0 x 3.5 in. (10.0 x 18.0 x 9.0 cm)

Weight

Handheld	2.9 lb (1.3 kg), 3.3 lb (1.5 kg) with battery
Desktop	3.5 lb (1.6 kg), 4.5 lb (2.0 kg)-1 battery, 5.5 lb (2.5 kg)-2 batteries
External Pump	3.0 lb (1.4 kg)

Communications

8530

USB (host and device)
and Ethernet. Stored data
accessible using flash
memory drive

8530EP

USB (host and device)
and Ethernet. Stored data
accessible using flash
memory drive plus, cable
assembly for external pump
USB (Hose and device). Stored
data accessible using flash
memory drive

8532

Power-AC

Switching AC power adapter with universal line cord included,
115-240 VAC

Analog Out

8530/8530EP

User selectable output,
0 to 5 V or 4 to 20 mA.
User selectable scaling range

Alarm Out

8530/8530EP

Relay or audible buzzer
Relay
Non-latching MOSFET switch
+ User selectable set point
+ -5% deadband
+ Connector 4-pin,
Mini-DIN connectors
Audible buzzer

8532

Screen

8530
8532

5.7 in. VGA color touchscreen
3.5 in. VGA color touchscreen

Gravimetric Sampling

8530/8530EP

Removable 37 mm cartridge
(user supplied)

CE Rating

Immunity
Emissions

EN61236-1:2006
EN61236-1:2006

Specifications are subject to change without notice.

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C.T. MALE ASSOCIATES ENGINEERING,
SURVEYING, ARCHITECTURE,
LANDSCAPE ARCHITECTURE &
GEOLOGY, D.P.C

STANDARD OPERATING PROCEDURE

SURFACE and SUBSURFACE SOIL SAMPLING

December 28, 2017

_____	_____	_____	_____
Print	Technical Reviewer	Signature	Date
_____	_____	_____	_____
Print	QA Manager	Signature	Date

Review of the SOP has been preformed and the SOP still reflects the current practice			
Initials		Date	
Initials		Date	

SOP: SURFACE AND SUBSURFACE SOIL SAMPLING

1.0 PURPOSE

This standard operating procedure (SOP) provides the methodology for collecting discrete surface and subsurface soil samples to characterize the nature of soil contamination, the areal and vertical extent of contaminated soil, to determine the geotechnical, physical, and chemical properties of the soil, and for remedial action confirmatory and/or documentation sampling.

2.0 SCOPE

This SOP applies to all C.T. Male Associates personnel and sub consultants engaged in collecting or otherwise handling surface or subsurface soil samples.

This SOP focuses on the most commonly used soil sampling tasks and applications and should be used in conjunction with other applicable project SOPs, including the following:

- SOP: Note Taking and Field Logs.
- SOP: Organic Vapor Monitoring and Air Monitoring
- SOP: Drilling and Associated Sampling Methods.
- SOP: Equipment Decontamination Procedures.
- SOP: Field Screening Soil Samples
- SOP: Collection of Quality Control Samples
- SOP: Documentation on a Chain-of-Custody
- SOP: Domestic Transport of Samples to Laboratories in USA

3.0 GENERAL

Selecting the proper methods and tools for surface and subsurface soil sampling is a critical part of field investigations and remedial actions. This SOP describes the

methods generally used for surface and subsurface soil sampling, as well as the tools commonly used.

Soil sample collection activities should adhere to the note-taking, decontamination, labeling, packaging, shipping, storage, and chain-of-custody requirements applicable to the soil sampling activities being conducted according to the site-specific QAPP.

Personnel who collect or handle the soil samples should wear, at a minimum, disposable nitrile gloves to prevent cross-contamination and provide personal protection. New gloves should be donned for sample collection at each location, or whenever gloves are torn or otherwise compromised. The project-specific Health and Safety Plan (HASP) provides information on site-specific personal protective equipment (PPE) requirements.

4.0 RESPONSIBILITIES

4.1 Project Manager

The Project Manager is responsible for providing adequate resources and ensuring that field staff have adequate experience and training to successfully comply with and execute project-specific SOPs and implement the project health, safety, and environment (HS&E) program. The Project Manager will solicit the appropriate technical expertise to identify suitable sampling methods and technology for the job given the current understanding of the site and project goals.

4.2 Health & Safety Officer

The Health & Safety Officer is assigned to oversee site-specific HS&E and ensure overall compliance with project HS&E requirements. The Health & Safety Officer conducts PPE evaluations, selects the appropriate PPE for the project, lists the requirements in the site-specific HASP, coordinates with the Field Team Leader to complete and certify the PPE program, and conducts project Health & Safety audits on the effectiveness of the HS&E program.

4.3 Site Health and Safety Officer

The role of Site Health and Safety Officer is delegated to the Field Team Leader by the Project Manager to assist in implementing the project HASP. The Project Manager

and/or Health & Safety Officer assists the Site Health and Safety Office /Field Team Leader with the health and safety program, implements the PPE requirements described in the project HASP and receives input from project staff that the assigned PPE requirements and on-going HS&E procedures are effective.

4.4 Field Team Leader

The Field Team Leader should ensure that soil samples are collected according to this procedure and other SOPs identified in Section 2.0. The Field Team Leader should also be required to make rational and justifiable decisions when deviations from this procedure are necessary because of field conditions or unforeseen problems. The Field Team Leader should consult the Project Manager if deviations from the site-specific QAPP are necessary because of field conditions. The Field Team Leader should document that the applicable requirements the site-specific HASP are followed.

5.0 PROCEDURES

5.1 General Guidelines

The following procedures should be used to collect soil samples for laboratory analysis:

- Unless otherwise specified, laboratory soil samples must be discrete samples and may not be composited before analysis.
- Soil samples must be collected according to the method specifications appropriate for the laboratory parameters to be analyzed.
- Soil samples must be collected with disposable or clean tools that have been decontaminated as outlined in SOP, Equipment Decontamination Procedures.
- Disposable nitrile gloves (at a minimum) must be worn and changed between sample collections.
- Soil samples must be placed in containers quickly and in the order of volatility; for example, volatile organic aromatic samples must be taken first, gasoline range organics next, heavier range organics next, and soil classification samples last.

- Sample containers must be quickly and adequately sealed, and rims must be cleaned before tightening lids; tape may be used only if known not to affect sample analysis.
- Sample containers must be labeled and handled as outlined in the site specific QAPP.
- Samples must immediately be preserved according to the method specifications appropriate for the laboratory parameters to be analyzed. And unless specified otherwise, at a minimum, the samples must be immediately chilled to 4 ± 2 degrees Celsius ($^{\circ}\text{C}$) and this temperature must be maintained through delivery to the laboratory for analysis.
- Sample holding times must conform to the method specifications of the required analytical methods.
- Alternative methods to obtain soil samples may be used only if the alternative methods have been approved by the Project Manager and documented in the site-specific QAPP and Environmental Services field Log.
- Soil samples collected for analysis of volatile organic compounds (VOCs), Per & Poly-fluoroalkyl substances (PFAS), and gasoline range organics (GROs) will be collected with special precautions as detailed below in Section 5.7.
- Each soil sample fraction collected for analyses other than VOCs, PFAS, GRO, or VPH will be thoroughly homogenized using a sampling spoon or trowel. The homogenized material will then be divided equally among the appropriate sample containers. The sample containers will then be sealed tightly. Care should be taken so that the sampling tools and containers (such as spoons and bowls) used for sample collection and homogenization does not interfere with the analytes of interest.
- Multi-incremental samples (MIS) should be collected by placing equal amounts (or aliquots) of soil collected from multiple locations into a decontaminated, dedicated collection container. The aliquots will then be homogenized using a sample collection tool such as a scoop or spoon. The homogenized material will

be divided equally among the appropriate sample containers, and the sample containers will be sealed tightly.

5.2 Sampling Tools and Equipment

Equipment that may be used to facilitate the collection of surface or subsurface soil samples includes, but is not limited to, the following items:

- Photoionization detector (PID) devices.
- Stainless-steel trowel, scoop, or spoon.
- Stainless-steel hand (bucket) auger.
- Stainless-steel or carbon steel split spoon, split barrel, or macro-core sampler.
- Shovels, pickaxes, pick mattocks, or similar excavating tools.
- Soil core samplers (En Core® sampler, TerraCore®, or equivalent), except for PFAS.
- Stainless-steel bowls or pans.
- Paper towels.
- Decontamination equipment (buckets, brushes, Alconox, etc.).
- High-density polyethylene (HDPE) sheeting.
- PPE.
- Sample cooler.
- Ice.
- Sample jars and labels.
- Chain-of-custody forms.
- Soil classification charts.

- Ziploc® (or similar) re-sealable bags.
- Survey stakes or flags.
- Hammer.

5.3 Decontamination

Before collecting soil samples, reusable, non-disposable sampling equipment should be decontaminated. Decontamination supplies must be on hand so that equipment can be decontaminated in the field if sampling equipment is to be reused. Each piece of reusable sampling equipment should be decontaminated between each sample location or sampling interval. Procedures presented in SOP Equipment Decontamination Procedures, shall be followed for decontamination of re-usable field equipment and for personnel decontamination.

Disposable sampling equipment will be used whenever feasible to minimize decontamination and the potential for cross-contamination. Disposable sample equipment will be observed before use to document that it is clean and free of potential contaminants.

5.4 Surface Soil Sampling

Surface soil sample will be collected using a stainless steel scoop, spoon, or other appropriate tools. Samples for VOC and PFAS analysis will be collected directly from the soil column at the specified sampling depth interval if possible. For non-VOC samples (i.e., PCBs), the sampler, wearing clean disposable nitrile gloves, will remove materials, including pebbles and roots, from the mixture as the sample is collected. Each non-VOC sample will be collected by thoroughly homogenizing material from the appropriate depth interval from the respective sampling location. A clean, decontaminated stainless-steel scoop or spoon will be used to collect the soil sample and fill all laboratory-supplied analytical sample containers.

5.5 Subsurface Soil Sampling

Before subsurface soil sampling, each sample location should be checked and cleared for buried utilities before intrusive activities begin.

5.5.1 Shallow Subsurface Soil Sampling with Hand Tools

Shallow subsurface soil samples can be collected by hand using a variety of sampling equipment and devices. Common equipment used to collect shallow subsurface soil samples include soil coring devices, various types of hand augers (bucket-type, continuous-flight, and posthole), and other common hand tools such as shovels and pickaxes. Depending on field conditions or sampling objectives, several types of sample collection equipment may be used to collect soil samples at a single location. Of the equipment listed, only soil coring devices collect an undisturbed soil sample and thus are recommended for sampling of VOCs. Bucket augers and other common hand tools are not recommended when an undisturbed soil sample for volatile organics is desired. Sampling personnel should choose the sampling equipment that is best suited for project requirements and task needs.

Using a decontaminated hand auger (or similar equipment), the soil borehole will be advanced to the depth immediately above the sampling interval, and cuttings will be removed from the borehole. Before advancing a borehole, remove unnecessary rocks, twigs, and other non-soil materials from the selected sampling location. Assemble the sampling equipment, if necessary, per the manufactures specifications and place the sampler in position with the bit or cutting shoe touching the ground. Begin turning the auger with a clockwise motion or driving the soil core device with the slide hammer until the desired sampling depth is obtained. During advancement of the auger or coring device, cuttings from within and around the borehole will be periodically removed and placed next to the borehole. If the sample is to be collected using the same hand auger or soil coring device, the auger bucket or core sampler will be decontaminated (or replaced with a decontaminated bucket or sampler) before collecting the soil sample. The discrete sample will then be collected by advancing the sampling equipment to the appropriate depth interval and retrieving the soil sample. When collecting samples at depths greater than 12 inches, it is advisable to discard approximately the upper 1 inch of material in the top portion of the auger or sampler because of borehole slough and cave-in. The sample will then be promptly transferred into laboratory-cleaned sample containers using a decontaminated stainless steel spoon or trowel.

5.5.2 Deep Subsurface Soil Sampling

Deep subsurface soil samples are typically collected using split-spoon and/or macro-core samplers. A split-spoon sampler is a soil coring device that consists of a length of carbon or stainless-steel tubing, split longitudinally and equipped with a sample shoe and a drive head. A macro-core sampler is a soil coring device that consists of a length of stainless steel tubing equipped with a screw-on sample shoe and drive head. Split-spoon samplers and macro-core samplers are used in conjunction with a power auger drill rig or direct-push vehicle, and are usually either hammered or hydraulically pushed into the interval to be sampled. The interval(s) to be sampled may be either predetermined or determined according to criteria observed during advancement of the drilling equipment as specified in the site-specific QAPP. The following procedures focus on sampling soil for chemical analysis, using a split-spoon or direct push system continuous macro-core sampler. Soil samples obtained for physical characterization are typically collected using similar procedures.

Drilling Method

Using hollow stem auger or advancing flush joint casing, the soil borehole will be advanced to the depth immediately above the sampling interval as described in SOP for Drilling and Associated Sampling. Utilize a split-spoon sampler to collect a relatively undisturbed, representative soil sample during the drilling activities. Standard Penetration Test blow counts for that sample, as well as the interval from which the sample was obtained, will be recorded on the Subsurface Exploration Logs. Depending on the size of the split-spoon employed, typically 18 to 24 inches of soil should be recovered in advance of the drill bit. The split-spoon sampler will then be removed from the borehole and opened exposing the soil core for sample collection and examination. Soil samples for laboratory analysis should be collected from the undisturbed, middle portion of the soil core and soil from the very ends of the soil core must be discarded as they often contain disturbed soils. The sample will then be immediately and quickly transferred into clean, laboratory sample containers using a decontaminated stainless steel spoon or scoop as described in Section 5.1. The soil core will be examined by the field geologist, screened for VOCs

using a PID (see SOP Organic Vapor Monitoring and Air Monitoring), and logged for lithology on the Subsurface Exploration Log.

Direct Push System Drilling Method

Direct push system soil samples are typically collected using a continuous macro-core sampler with acetate liners using the direct push system drilling procedures described in SOP for Drilling and Associated Sampling. At the top of each sample interval, the macro-core sampler will be driven into the substrate to a depth equal to the length of the sampler. After the sampler has been advanced, it is retrieved from the borehole and the acetate liner containing the soil core is placed on a firm, horizontal surface, for opening, inspection, and sampling. The acetate liner for each sample core is then cut open to expose the soil sample core for soil sampling and examination. Samples for laboratory analysis will be immediately transferred into clean laboratory sample containers using a decontaminated stainless-steel spoon or scoop, as described in Section 5.1. The soil core will then be examined by the field geologist, screened for VOCs using a PID, and logged for lithology. Special attention must be given to labeling and storage of individual core samples when continuous soil samples are collected from a single boring. In many instances, soil cores can be produced faster than they can be opened, logged, screened and sampled by a Field Geologist/Environmental Scientist. In those instances when a backlog of cores is being generated, protect the cores from direct sunlight, excessive ambient temperatures, and rain. These conditions may have an adverse effect on highly sensitive volatile organics within the core or the instruments used for screening. Keep the cores labeled so that the up/down orientation is not lost. If necessary, log soils for lithology information after sample collection.

5.6 Excavation and Stockpile Sampling

Soil sampling of excavations and stockpiles should be conducted using similar techniques as described in Sections 5.4 and 5.5.1.

5.6.1 Excavation Sampling

When collecting soil samples from excavations including test pits, soil samples should generally be collected from freshly uncovered soil. Remove 4 to 6 inches of soil promptly before sample collection. If the excavation has been open for longer

than 1 hour, remove at least 12 inches of soil immediately before collection. Do not collect samples from disturbed soil that has fallen into the bottom of the excavation pit. If the depth of the excavation (i.e., greater than 4 feet) is such that sampling cannot be safely conducted within the excavation, soil samples may be collected directly from the excavator bucket. When collecting soil samples from an excavator bucket, samples should be collected from the center of the bucket and away from the bucket sides. Refer to the project-specific HASP and/or consult with the Project Manager and/or Health & Safety Officer regarding excavation safety before entering open excavations.

5.6.2 Stockpile Sampling

Stockpiled soil must be field screened before sample collection. Field screening and analytical soil samples must be collected at least 18 inches beneath the exposed surface of the stockpile, unless additional shallower field screening samples are needed to represent soil contaminant heterogeneity. Contamination can be persistent near the bottom of long-term stockpiles, so some samples shall be collected near the base. Soil samples from the surface, within, and near the bottom of a stockpile will be collected using the methods previously discussed in Sections 5.4 and 5.5.1.

5.7 Volatile Organic Soil Sampling

If VOCs are among the analytes to be investigated at a particular site, discrete soil samples will be collected following opening of the soil core. Soil samples for VOC analysis should be collected in a way that minimizes sample volatilization through excessive atmospheric exposure, mixing, and/or other disturbance. It is recommended that VOC samples be collected using core-type samples such as split-spoons, macro-core samplers, and soil coring devices that reduce the loss of volatiles during sampling. Soil core samplers must be constructed of non-reactive materials that will minimize the loss of volatile organics from the sample.

VOC soil samples analyzed using U.S. Environmental Protection Agency (EPA) Method SW8260B will be collected as follows:

- To collect a sample, have ready a pre-weighed, pre-preserved, and labeled 40 mL VOC vial containing methanol (MeOH) supplied by the laboratory. Place 10 grams of soil into the VOC vial containing 10 mL of MeOH. Interim storage/containers (such as resealable plastic bags) are not allowed.
- After sealing, gently agitate the sample so that entire sample is submerged.
- Do not place tape, including evidence tape, on the container directly.
- Samples collected shall be placed inside coolers to maintain the samples at 4°C \pm 2 degrees Celsius (°C).
- Collect a sample of the same material from the same location in an unpreserved jar for percent moisture determination.
- Collect appropriate field and laboratory quality control samples including field duplicates and matrix spike/matrix spike duplicate (MS/MSD) samples.
- Analytical samples should be collected in the following order:
 - VOCs, GRO, VPH, and BETX
 - Semi-volatile organic compounds (SVOCs); including pesticides, herbicides, diesel range organics (GRO) , residual range organics (RRO), and polychlorinated biphenyls (PCBs)
 - Total Organic Carbon
 - Metals
- VOC samples should be accompanied by an appropriate trip blank from the time of the collection until analysis at the project laboratory.

VOC soil samples analyzed using U.S. Environmental Protection Agency (EPA) Method SW-846 Method 5035A will be collected as follows:

- Discrete soil samples can be collected using a 5-gram soil core sampler with a new, dedicated, and disposable sample syringe or tip as described in American

Society for Testing and Materials (ASTM) standard D6418-09. These devices are used to collect a specific soil sample mass for volatile organic analysis in a manner that minimizes loss of contaminants because of volatilization or biodegradation. Frequently accepted discrete soil core samplers are listed below.

- En Core® sampler
 - TerraCore® sampler
 - EasyDraw Syringe® with PowerStop Handle® sampler
 - Core N' One™ sampler
 - Lock N' Load™ sampler
- Soil samples will be collected from a specified location and soil depth as determined by field screening or as determined in the project-specific HASP. After determining the sample location, the soil core sampler will be plunged into the soil core to collect a sample.
 - To collect a sample, have ready a pre-weighed, pre-preserved, and labeled 40 mL VOC vial containing sodium bisulfate/water preservative. With the syringe or plunger seated in the handle, push the soil core sampler into freshly exposed soil until the sample chamber is filled. Do not pull the syringe or plunger back before use.
 - Wipe soil or debris from the outside of the soil core sampler and remove excess soil that extends beyond the end of the sampler, so that the soil plug is flush with the end of the sampler. A filled chamber will deliver approximately 5 grams of soil.
 - Place the mouth of the soil core sampler into the 40-ml VOC vial containing sodium bisulfate/water preservative and extrude the 5-gram sample into the VOC vial by pushing the syringe or plunger down.
 - Quickly seal the lid back on the 40-ml VOC vial.

- Take care not to leave soil grains along the threaded cap area of the VOC vial so that the lid can be screwed on tightly forming a tight seal. Be sure to remove soil or debris from the top and/or threads of the vial.
- Following collection, samples will be labeled with unique sample identification, and packaged appropriately.
- Samples collected shall be placed inside coolers to maintain the samples at 4°C \pm 2 degrees Celsius (°C).
- VOC containers should be padded so that the glass walls of the containers do not come into direct contact with ice or other samples, thereby reducing the risk of cracking the glass containers.

5.8 PFAS Soil Sampling

If PFAS are among the analytes to be investigated at a particular site, discrete soil samples will be collected following the surface or subsurface investigation activity. Soil samples for PFAS analysis should be collected in a way that minimizes sample volatilization or degradation through excessive atmospheric exposure, mixing, and/or other disturbance. PFAS samples shall be collected using split-spoons, macro-core samplers, and hand tools.

PFAS soil samples analyzed as specified in the site specific work plan and site specific QAPP. Samples should be collected as follows:

- Soil samples will be collected from a specified location and soil depth as determined by field screening or as determined in the project-specific work plan.
- To collect a sample, place soil into a laboratory supplied container specifically required for PFAS media samples. Ensure non-PFAS containing PPE is used.
- Wipe soil or debris from the outside of the sample container and place lid on container.

- Following collection, samples will be labeled with unique sample identification, packaged appropriately, and kept at a temperature of approximately 4 degrees Celsius inside a cooler for preservation.
- Containers should be padded so that the glass walls of the containers do not come into direct contact with ice or other samples, thereby reducing the risk of cracking the glass containers.

5.9 Diesel Range Organics (DRO) / SVOC / General Chemistry / Metals

Using either a composited sample or a homogenized, discrete sample, fill the remaining containers in the order listed in the QAPP. Unless aliquot weights are listed, pack the soil into the sample jars leaving no headspace. If allowed by applicable regulations, the WIDRO sample may be weighed directly into the sample container by placing the pre-weighed sample container on the field balance, taring the field balance, then adding the appropriate amount of soil to the container to reach the desired sample weight (~25 g).

Wipe the container lip and screw threads to remove soil and provide a good sealing surface, and immediately screw on the lid.

5.10 Quality Assurance/Quality Control Procedures and Samples

Quality Assurance/Quality Control (QA/QC) samples will be collected during soil sampling according to the site-specific QAPP and will include duplicate (replicate), matrix spike, matrix spike duplicate, trip blank and equipment (field) blank samples. One set of QA/QC samples will be collected per 20 field samples per media (i.e., soil, groundwater, etc.).

QA/QC samples will be assigned unique sample identifications and handled and submitted to the laboratory the same as field samples.

5.10.1 Equipment Blanks

An equipment blank sample is collected in the field by running ASTM Type II Reagent-Grade water (or deionized water with less than 15 microSiemens conductivity) across the surface of re-usable, decontaminated sampling equipment and into appropriate sample containers.

5.10.2 Field Duplicate Samples

Field duplicate samples will be collected simultaneously or in immediate succession to the normal samples using identical sampling techniques.

5.10.3 Matrix Spikes and Matrix Spike Duplicates

Matrix spike/matrix spike duplicate samples will be collected simultaneously or in immediate succession to the normal samples using identical sampling techniques.

5.10.4 Trip Blanks

A trip blank is a sample of analyte-free water prepared by the laboratory, taken to the sampling site along with the sample bottles, and returned to the laboratory for analysis, to measure possible cross contamination of containers/samples during shipping to and from the site. Typically there is only one trip blank per chain of custody per sample cooler, except when trip blanks require different preservatives for different methods.

6.0 Handling

After collection, all samples should be handled as few times as possible. Samplers should use extreme care to ensure that samples are not contaminated. Immediately after samples are collected, they are bubble wrap or bagged and placed in a cooler containing bagged ice. Samples will be kept cold ($\leq 6^{\circ}\text{C}$, but not frozen) until receipt at the laboratory, where they are to be stored in a refrigerated area. Keep samples secure to prevent tampering. If sample coolers are left in a vehicle or field office for temporary storage, the area will be locked and secured.

6.1 Shipment/Delivery

Once the cooler is packed to prevent breaking of containers, the proper COC documentation is relinquished by the sampler, placed into a plastic bag, and included in the cooler. Custody seals may be used, and the coolers should be taped shut if not hand delivered.



Department of
Environmental
Conservation

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

Under NYSDEC's Part 375 Remedial Programs

April 2023



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ERRATA SHEET for

**SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES
(PFAS) Under NYSDEC's Part 375 Remedial Programs Issued January 17, 2020**

Citation and Page Number	Current Text	Corrected Text	Date
Title of Appendix I, page 32	Appendix H	Appendix I	2/25/2020
Document Cover, page 1	Guidelines for Sampling and Analysis of PFAS	Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs	9/15/2020
Data Assessment and Application to Site Cleanup Page 3	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published	Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published	3/28/2023
Water Sample Results Page 3	PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water if PFOA or PFOS is detected in any water sample at or above 10 ng/L (ppt) and is determined to be attributable to the site, either by a comparison of upgradient and downgradient levels, or the presence of soil source areas, as defined below.	NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These guidance values also include criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt). Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.	3/28/2023
Soil Sample Results Page 3	Soil cleanup objectives for PFOA and PFOS have been proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values:	NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:	3/28/2023
Protection of Groundwater Page 3	PFOA (ppb) 1.1 PFOS (ppb) 3.7	PFOA (ppb) 0.8 PFOS (ppb) 1.0	3/28/2023

Citation and Page Number	Current Text	Corrected Text	Date
Footnote 2 Page 3	The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	3/28/2023
Testing for Imported Soil Page 4	If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable.	If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable.	3/28/2023
Routine Analysis, page 9	“However, laboratories analyzing environmental samples...PFOA and PFOS in drinking water by EPA Method 537, 537.1 or ISO 25101.”	“However, laboratories analyzing environmental samples...PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533.”	9/15/2020
Additional Analysis, page 9, new paragraph regarding soil parameters	None	“In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (EPA Method 9060), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils.”	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Data Assessment and Application to Site Cleanup Page 10	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFAS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Target levels for cleanup of PFAS in other media, including biota and sediment, have not yet been established by the DEC.	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.	9/15/2020
Water Sample Results Page 10	<p>PFAS should be further assessed and considered as a potential contaminant of concern in groundwater or surface water (...)</p> <p>If PFAS are identified as a contaminant of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.</p>	<p>PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water (...)</p> <p>If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.</p>	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Soil Sample Results, page 10	<p>“The extent of soil contamination for purposes of delineation and remedy selection should be determined by having certain soil samples tested by Synthetic Precipitation Leaching Procedure (SPLP) and the leachate analyzed for PFAS. Soil exhibiting SPLP results above 70 ppt for either PFOA or PFOS (individually or combined) are to be evaluated during the cleanup phase.”</p>	<p>“Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values. “</p> <p>[Interim SCO Table]</p> <p>“PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP.</p> <p>As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference:</p> <p>https://www.nj.gov/dep/srp/guidance/rs/daf.pdf. ”</p>	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Testing for Imported Soil Page 11	<p>Soil imported to a site for use in a soil cap, soil cover, or as backfill is to be tested for PFAS in general conformance with DER-10, Section 5.4(e) for the PFAS Analyte List (Appendix F) using the analytical procedures discussed below and the criteria in DER-10 associated with SVOCs.</p> <p>If PFOA or PFOS is detected in any sample at or above 1 µg/kg, then soil should be tested by SPLP and the leachate analyzed for PFAS. If the SPLP results exceed 10 ppt for either PFOA or PFOS (individually) then the source of backfill should be rejected, unless a site-specific exemption is provided by DER. SPLP leachate criteria is based on the Maximum Contaminant Levels proposed for drinking water by New York State's Department of Health, this value may be updated based on future Federal or State promulgated regulatory standards. Remedial parties have the option of analyzing samples concurrently for both PFAS in soil and in the SPLP leachate to minimize project delays. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.</p>	<p>Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable.</p> <p>PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.</p>	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Footnotes	None	¹ TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances. ² The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the soil cleanup objective for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	9/15/2020
Additional Analysis, page 9	In cases... soil parameters, such as Total Organic Carbon (EPA Method 9060), soil...	In cases... soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil...	1/8/2021
Appendix A, General Guidelines, fourth bullet	List the ELAP-approved lab(s) to be used for analysis of samples	List the ELAP- certified lab(s) to be used for analysis of samples	1/8/2021
Appendix E, Laboratory Analysis and Containers	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by ISO Method 25101.	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101	1/8/2021
Water Sample Results Page 9	<p>“In addition, further assessment of water may be warranted if either of the following screening levels are met:</p> <p>a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or</p> <p>b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L”</p>	Deleted	6/15/2021

Citation and Page Number	Current Text	Corrected Text	Date
Routine Analysis, Page XX	Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP)... criteria set forth in the DER's laboratory guidelines for PFAS in non-potable water and solids (Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids).	Deleted	5/31/2022
Analysis and Reporting, Page XX	As of October 2020, the United States Environmental Protection Agency (EPA) does not have a validated method for analysis of PFAS for media commonly analyzed under DER remedial programs (non-potable waters, solids). DER has developed the following guidelines to ensure consistency in analysis and reporting of PFAS.	Deleted	5/31/2022
Routine Analysis, Page XX	LC-MS/MS analysis for PFAS using methodologies based on EPA Method 537.1 is the procedure to use for environmental samples. Isotope dilution techniques should be utilized for the analysis of PFAS in all media.	EPA Method 1633 is the procedure to use for environmental samples.	
Soil Sample Results, Page XX	Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6	Soil cleanup objectives for PFOA and PFOS have been proposed in an upcoming revision to 6 NYCRR Part 375-6	
Appendix A	"Include in the text... LC-MS/MS for PFAS using methodologies based on EPA Method 537.1"	"Include in the textEPA Method 1633"	
Appendix A	"Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, EPA Method 533, or ISO 25101"	Deleted	
Appendix B	"Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1"	"Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633"	

Citation and Page Number	Current Text	Corrected Text	Date
Appendix C	“Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1”	“Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633”	
Appendix D	“Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1”	“Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633”	
Appendix G		Updated to include all forty PFAS analytes in EPA Method 533	
Appendix H		Deleted	
Appendix I	Appendix I	Appendix H	
Appendix H	“These guidelines are intended to be used for the validation of PFAS analytical results for projects within the Division of Environmental Remediation (DER) as well as aid in the preparation of a data usability summary report.”	“These guidelines are intended to be used for the validation of PFAS using EPA Method 1633 for projects within the Division of Environmental Remediation (DER).”	
Appendix H	“The holding time is 14 days...”	“The holding time is 28 days...”	
Appendix H, Initial Calibration	“The initial calibration should contain a minimum of five standards for linear fit...”	“The initial calibration should contain a minimum of six standards for linear fit...”	
Appendix H, Initial Calibration	Linear fit calibration curves should have an R ² value greater than 0.990.	Deleted	
Appendix H, Initial Calibration Verification	Initial Calibration Verification Section	Deleted	
Appendix H	secondary Ion Monitoring Section	Deleted	
Appendix H	Branched and Linear Isomers Section	Deleted	

Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs

Objective

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) performs or oversees sampling of environmental media and subsequent analysis of PFAS as part of remedial programs implemented under 6 NYCRR Part 375. To ensure consistency in sampling, analysis, reporting, and assessment of PFAS, DER has developed this document which summarizes currently accepted procedures and updates previous DER technical guidance pertaining to PFAS.

Applicability

All work plans submitted to DEC pursuant to one of the remedial programs under Part 375 shall include PFAS sampling and analysis procedures that conform to the guidelines provided herein.

As part of a site investigation or remedial action compliance program, whenever samples of potentially affected media are collected and analyzed for the standard Target Analyte List/Target Compound List (TAL/TCL), PFAS analysis should also be performed. Potentially affected media can include soil, groundwater, surface water, and sediment. Based upon the potential for biota to be affected, biota sampling and analysis for PFAS may also be warranted as determined pursuant to a Fish and Wildlife Impact Analysis. Soil vapor sampling for PFAS is not required.

Field Sampling Procedures

DER-10 specifies technical guidance applicable to DER's remedial programs. Given the prevalence and use of PFAS, DER has developed "best management practices" specific to sampling for PFAS. As specified in DER-10 Chapter 2, quality assurance procedures are to be submitted with investigation work plans. Typically, these procedures are incorporated into a work plan, or submitted as a stand-alone document (e.g., a Quality Assurance Project Plan). Quality assurance guidelines for PFAS are listed in Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS.

Field sampling for PFAS performed under DER remedial programs should follow the appropriate procedures outlined for soils, sediments, or other solids (Appendix B), non-potable groundwater (Appendix C), surface water (Appendix D), public or private water supply wells (Appendix E), and fish tissue (Appendix F).

QA/QC samples (e.g. duplicates, MS/MSD) should be collected as specified in DER-10, Section 2.3(c). For sampling equipment coming in contact with aqueous samples only, rinsate or equipment blanks should be collected. Equipment blanks should be collected at a minimum frequency of one per day per site or one per twenty samples, whichever is more frequent.

Analysis and Reporting

The investigation work plan should describe analysis and reporting procedures, including laboratory analytical procedures for the methods discussed below. As specified in DER-10 Section 2.2, laboratories should provide a full Category B deliverable. In addition, a Data Usability Summary Report (DUSR) should be prepared by an independent, third-party data validator. Electronic data submissions should meet the requirements provided at: <https://www.dec.ny.gov/chemical/62440.html>.

DER has developed a *PFAS Analyte List* (Appendix G) for remedial programs to understand the nature of contamination at sites. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. If lab and/or matrix specific issues are encountered for any analytes, the DER project manager, in consultation with the DER chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each site. As with other contaminants that are analyzed for at a site, the *PFAS Analyte List* may be refined for future sampling events based on investigative findings.

Routine Analysis

EPA Method 1633 is the procedure to use for environmental samples. Reporting limits for PFOA and PFOS in aqueous samples should not exceed 2 ng/L. Reporting limits for PFOA and PFOS in solid samples should not exceed 0.5 µg/kg. Reporting limits for all other PFAS in aqueous and solid media should be as close to these limits as possible. If laboratories indicate that they are not able to achieve these reporting limits for the entire *PFAS Analyte List*, site-specific decisions regarding acceptance of elevated reporting limits for specific PFAS can be made by the DER project manager in consultation with the DER chemist. Data review guidelines were developed by DER to ensure data comparability and usability (Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids).

Additional Analysis

Additional laboratory methods for analysis of PFAS may be warranted at a site, such as the Synthetic Precipitation Leaching Procedure (SPLP) and Total Oxidizable Precursor Assay (TOP Assay).

In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils.

SPLP is a technique used to determine the mobility of chemicals in liquids, soils and wastes, and may be useful in determining the need for addressing PFAS-containing material as part of the remedy. SPLP by EPA Method 1312 should be used unless otherwise specified by the DER project manager in consultation with the DER chemist.

Impacted materials can be made up of PFAS that are not analyzable by routine analytical methodology. A TOP Assay can be utilized to conceptualize the amount and type of oxidizable PFAS which could be liberated in the environment, which approximates the maximum concentration of perfluoroalkyl substances that could be generated if all polyfluoroalkyl substances were oxidized. For example, some polyfluoroalkyl substances may degrade or transform to form perfluoroalkyl substances (such as PFOA or PFOS), resulting in an increase in perfluoroalkyl substance concentrations as contaminated groundwater moves away from a source. The TOP Assay converts, through oxidation, polyfluoroalkyl substances (precursors) into perfluoroalkyl substances that can be detected by routine analytical methodology.¹

¹ TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances.

Commercial laboratories have adopted methods which allow for the quantification of targeted PFAS in air and biota. The EPA's Office of Research and Development (ORD) is currently developing methods which allow for air emissions characterization of PFAS, including both targeted and non-targeted analysis of PFAS. Consult with the DER project manager and the DER chemist for assistance on analyzing biota/tissue and air samples.

Data Assessment and Application to Site Cleanup

Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.

Water Sample Results

NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These human health criteria should also be applied to surface water that is used as a water supply. This guidance also includes criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt). Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.

If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.

Soil Sample Results

NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:

Guidance Values for Anticipated Site Use	PFOA (ppb)	PFOS (ppb)
Unrestricted	0.66	0.88
Residential	6.6	8.8
Restricted Residential	33	44
Commercial	500	440
Industrial	600	440
Protection of Groundwater ²	0.8	1.0

PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These

² The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).

additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP.

As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference:

<https://www.nj.gov/dep/srp/guidance/rs/daf.pdf>.

Testing for Imported Soil

Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable.

PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.

Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS

The following guidelines (general and PFAS-specific) can be used to assist with the development of a QAPP for projects within DER involving sampling and analysis of PFAS.

General Guidelines in Accordance with DER-10

- Document/work plan section title – Quality Assurance Project Plan
- Summarize project scope, goals, and objectives
- Provide project organization including names and resumes of the project manager, Quality Assurance Officer (QAO), field staff, and Data Validator
 - The QAO should not have another position on the project, such as project or task manager, that involves project productivity or profitability as a job performance criterion
- List the ELAP certified lab(s) to be used for analysis of samples
- Include a site map showing sample locations
- Provide detailed sampling procedures for each matrix
- Include Data Quality Usability Objectives
- List equipment decontamination procedures
- Include an “Analytical Methods/Quality Assurance Summary Table” specifying:
 - Matrix type
 - Number or frequency of samples to be collected per matrix
 - Number of field and trip blanks per matrix
 - Analytical parameters to be measured per matrix
 - Analytical methods to be used per matrix with minimum reporting limits
 - Number and type of matrix spike and matrix spike duplicate samples to be collected
 - Number and type of duplicate samples to be collected
 - Sample preservation to be used per analytical method and sample matrix
 - Sample container volume and type to be used per analytical method and sample matrix
 - Sample holding time to be used per analytical method and sample matrix
- Specify Category B laboratory data deliverables and preparation of a DUSR

Specific Guidelines for PFAS

- Include in the text that sampling for PFAS will take place
- Include in the text that PFAS will be analyzed by EPA Method 1633
- Include the list of PFAS compounds to be analyzed (*PFAS Analyte List*)
- Include the laboratory SOP for PFAS analysis
- List the minimum method-achievable Reporting Limits for PFAS
 - Reporting Limits should be less than or equal to:
 - Aqueous – 2 ng/L (ppt)
 - Solids – 0.5 µg/kg (ppb)
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
- Include detailed sampling procedures
 - Precautions to be taken
 - Pump and equipment types
 - Decontamination procedures
 - Approved materials only to be used
- Specify that regular ice only will be used for sample shipment
- Specify that equipment blanks should be collected at a minimum frequency of 1 per day per site for each matrix

Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids

General

The objective of this protocol is to give general guidelines for the collection of soil, sediment and other solid samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Containers

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel spoon
- stainless steel bowl
- steel hand auger or shovel without any coatings

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Sampling is often conducted in areas where a vegetative turf has been established. In these cases, a pre-cleaned trowel or shovel should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. Surface soil samples (e.g. 0 to 6 inches below surface) should then be collected using a pre-cleaned, stainless steel spoon. Shallow subsurface soil samples (e.g. 6 to ~36 inches below surface) may be collected by digging a hole using a pre-cleaned hand auger or shovel. When the desired subsurface depth is reached, a pre-cleaned hand auger or spoon shall be used to obtain the sample.

When the sample is obtained, it should be deposited into a stainless steel bowl for mixing prior to filling the sample containers. The soil should be placed directly into the bowl and mixed thoroughly by rolling the material into the middle until the material is homogenized. At this point the material within the bowl can be placed into the laboratory provided container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at $4 \pm 2^{\circ}$ Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A soil log or sample log shall document the location of the sample/borehole, depth of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix C - Sampling Protocols for PFAS in Monitoring Wells

General

The objective of this protocol is to give general guidelines for the collection of groundwater samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel inertia pump with HDPE tubing
- peristaltic pump equipped with HDPE tubing and silicone tubing
- stainless steel bailer with stainless steel ball
- bladder pump (identified as PFAS-free) with HDPE tubing

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Monitoring wells should be purged in accordance with the sampling procedure (standard/volume purge or low flow purge) identified in the site work plan, which will determine the appropriate time to collect the sample. If sampling using standard purge techniques, additional purging may be needed to reduce turbidity levels, so samples contain a limited amount of sediment within the sample containers. Sample containers that contain sediment may cause issues at the laboratory, which may result in elevated reporting limits and other issues during the sample preparation that can compromise data usability. Sampling personnel should don new nitrile gloves prior to sample collection due to the potential to contact PFAS containing items (not related to the sampling equipment) during the purging activities.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at $4 \pm 2^\circ$ Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Additional equipment blank samples may be collected to assess other equipment that is utilized at the monitoring well
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A purge log shall document the location of the sample, sampling equipment, groundwater parameters, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix D - Sampling Protocols for PFAS in Surface Water

General

The objective of this protocol is to give general guidelines for the collection of surface water samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel cup

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Where conditions permit, (e.g. creek or pond) sampling devices (e.g. stainless steel cup) should be rinsed with site medium to be sampled prior to collection of the sample. At this point the sample can be collected and poured into the sample container.

If site conditions permit, samples can be collected directly into the laboratory container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at $4 \pm 2^\circ$ Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A sample log shall document the location of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells

General

The objective of this protocol is to give general guidelines for the collection of water samples from private water supply wells (with a functioning pump) for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101. The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials (e.g. plumbers tape), including sample bottle cap liners with a PTFE layer.

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Locate and assess the pressure tank and determine if any filter units are present within the building. Establish the sample location as close to the well pump as possible, which is typically the spigot at the pressure tank. Ensure sampling equipment is kept clean during sampling as access to the pressure tank spigot, which is likely located close to the ground, may be obstructed and may hinder sample collection.

Prior to sampling, a faucet downstream of the pressure tank (e.g., washroom sink) should be run until the well pump comes on and a decrease in water temperature is noted which indicates that the water is coming from the well. If the homeowner is amenable, staff should run the water longer to purge the well (15+ minutes) to provide a sample representative of the water in the formation rather than standing water in the well and piping system including the pressure tank. At this point a new pair of nitrile gloves should be donned and the sample can be collected from the sample point at the pressure tank.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at $4 \pm 2^\circ$ Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- If equipment was used, collect one equipment blank per day per site and a minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers.
- A field reagent blank (FRB) should be collected at a rate of one per 20 samples. The lab will provide a FRB bottle containing PFAS free water and one empty FRB bottle. In the field, pour the water from the one bottle into the empty FRB bottle and label appropriately.
- Request appropriate data deliverable (Category B) and an electronic data deliverable
- For sampling events where multiple private wells (homes or sites) are to be sampled per day, it is acceptable to collect QC samples at a rate of one per 20 across multiple sites or days.

Documentation

A sample log shall document the location of the private well, sample point location, owner contact information, sampling equipment, purge duration, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate and available (e.g. well construction, pump type and location, yield, installation date). Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appendix F - Sampling Protocols for PFAS in Fish

This appendix contains a copy of the current SOP developed by the Division of Fish and Wildlife (DFW) entitled “General Fish Handling Procedures for Contaminant Analysis” (Ver. 8). This SOP should be followed when collecting fish for contaminant analysis. Note, however, that the Bureau of Ecosystem Health will not be supplying bags or tags. All supplies are the responsibility of the collector

Procedure Name: General Fish Handling Procedures for Contaminant Analysis

Number: FW-005

Purpose: This procedure describes data collection, fish processing and delivery of fish collected for contaminant monitoring. It contains the chain of custody and collection record forms that should be used for the collections.

Organization: Environmental Monitoring Section
Bureau of Ecosystem Health
Division of Fish and Wildlife (DFW)
New York State Department of Environmental Conservation (NYSDEC)
625 Broadway
Albany, New York 12233-4756

Version: 8

Previous Version Date: 21 March 2018

Summary of Changes to this Version: Updated bureau name to Bureau of Ecosystem Health. Added direction to list the names of all field crew on the collection record. Minor formatting changes on chain of custody and collection records.

Originator or Revised by: Wayne Richter, Jesse Becker

Date: 26 April 2019

Quality Assurance Officer and Approval Date: Jesse Becker, 26 April 2019

**NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION**

GENERAL FISH HANDLING PROCEDURES FOR CONTAMINANT ANALYSES

- A. Original copies of all continuity of evidence (i.e., Chain of Custody) and collection record forms must accompany delivery of fish to the lab. A copy shall be directed to the Project Leader or as appropriate, Wayne Richter. All necessary forms will be supplied by the Bureau of Ecosystem Health. Because some samples may be used in legal cases, it is critical that each section is filled out completely. Each Chain of Custody form has three main sections:
1. The top box is to be filled out **and signed** by the person responsible for the fish collection (e.g., crew leader, field biologist, researcher). This person is responsible for delivery of the samples to DEC facilities or personnel (e.g., regional office or biologist).
 2. The second section is to be filled out **and signed** by the person responsible for the collections while being stored at DEC, before delivery to the analytical lab. This may be the same person as in (1), but it is still required that they complete the section. Also important is the **range of identification numbers** (i.e., tag numbers) included in the sample batch.
 3. Finally, the bottom box is to record any transfers between DEC personnel and facilities. Each subsequent transfer should be **identified, signed, and dated**, until laboratory personnel take possession of the fish.
- B. The following data are required on each **Fish Collection Record** form:
1. Project and Site Name.
 2. DEC Region.
 3. All personnel (and affiliation) involved in the collection.
 4. Method of collection (gill net, hook and line, etc.)
 5. Preservation Method.
- C. The following data are to be taken on each fish collected and recorded on the **Fish Collection Record** form:
1. Tag number - Each specimen is to be individually jaw tagged at time of collection with a unique number. Make sure the tag is turned out so that the number can be read without opening the bag. Use tags in sequential order. For small fish or composite samples place the tag inside the bag with the samples. The Bureau of Ecosystem Health can supply the tags.
 2. Species identification (please be explicit enough to enable assigning genus and species). Group fish by species when processing.
 3. Date collected.
 4. Sample location (waterway and nearest prominent identifiable landmark).
 5. Total length (nearest mm or smallest sub-unit on measuring instrument) and weight (nearest g or

smallest sub-unit of weight on weighing instrument). Take all measures as soon as possible with calibrated, protected instruments (e.g. from wind and upsets) and prior to freezing.

6. Sex - fish may be cut enough to allow sexing or other internal investigation, but do not eviscerate. Make any incision on the right side of the belly flap or exactly down the midline so that a left-side fillet can be removed.

D. General data collection recommendations:

1. It is helpful to use an ID or tag number that will be unique. It is best to use metal striped bass or other uniquely numbered metal tags. If uniquely numbered tags are unavailable, values based on the region, water body and year are likely to be unique: for example, R7CAY11001 for Region 7, Cayuga Lake, 2011, fish 1. If the fish are just numbered 1 through 20, we have to give them new numbers for our database, making it more difficult to trace your fish to their analytical results and creating an additional possibility for errors.
 2. Process and record fish of the same species sequentially. Recording mistakes are less likely when all fish from a species are processed together. Starting with the bigger fish species helps avoid missing an individual.
 3. If using Bureau of Ecosystem Health supplied tags or other numbered tags, use tags in sequence so that fish are recorded with sequential Tag Numbers. This makes data entry and login at the lab and use of the data in the future easier and reduces keypunch errors.
 4. Record length and weight as soon as possible after collection and before freezing. Other data are recorded in the field upon collection. An age determination of each fish is optional, but if done, it is recorded in the appropriate "Age" column.
 5. For composite samples of small fish, record the number of fish in the composite in the Remarks column. Record the length and weight of each individual in a composite. All fish in a composite sample should be of the same species and members of a composite should be visually matched for size.
 6. Please submit photocopies of topographic maps or good quality navigation charts indicating sampling locations. GPS coordinates can be entered in the Location column of the collection record form in addition to or instead for providing a map. These records are of immense help to us (and hopefully you) in providing documented location records which are not dependent on memory and/or the same collection crew. In addition, they may be helpful for contaminant source trackdown and remediation/control efforts of the Department.
 7. When recording data on fish measurements, it will help to ensure correct data recording for the data recorder to call back the numbers to the person making the measurements.
- E. Each fish is to be placed in its own individual plastic bag. For small fish to be analyzed as a composite, put all of the fish for one composite in the same bag but use a separate bag for each composite. It is important to individually bag the fish to avoid difficulties or cross contamination when processing the fish for chemical analysis. Be sure to include the fish's tag number inside the bag, preferably attached to the fish with the tag number turned out so it can be read. Tie or otherwise secure the bag closed. **The Bureau of Ecosystem Health will supply the bags.** If necessary, food grade bags may be procured from a suitable vendor (e.g., grocery store). It is preferable to redundantly label each bag with a manila tag tied between the knot and the body of the bag. This tag should be labeled with the project name, collection location, tag number, collection date, and fish species. If scales are collected, the scale envelope should be labeled with

the same information.

- F. Groups of fish, by species, are to be placed in one large plastic bag per sampling location. **The Bureau of Ecosystem Health will supply the larger bags.** Tie or otherwise secure the bag closed. Label the site bag with a manila tag tied between the knot and the body of the bag. The tag should contain: project, collection location, collection date, species and **tag number ranges**. Having this information on the manila tag enables lab staff to know what is in the bag without opening it.
- G. Do not eviscerate, fillet or otherwise dissect the fish unless specifically asked to. If evisceration or dissection is specified, the fish must be cut along the exact midline or on the right side so that the left side fillet can be removed intact at the laboratory. If filleting is specified, the procedure for taking a standard fillet (SOP PREPLAB 4) must be followed, including removing scales.
- H. Special procedures for PFAS: Unlike legacy contaminants such as PCBs, which are rarely found in day to day life, PFAS are widely used and frequently encountered. Practices that avoid sample contamination are therefore necessary. While no standard practices have been established for fish, procedures for water quality sampling can provide guidance. The following practices should be used for collections when fish are to be analyzed for PFAS:
 - No materials containing Teflon.
 - No Post-it notes.
 - No ice packs; only water ice or dry ice.
 - Any gloves worn must be powder free nitrile.
 - No Gore-Tex or similar materials (Gore-Tex is a PFC with PFOA used in its manufacture).
 - No stain repellent or waterproof treated clothing; these are likely to contain PFCs.
 - Avoid plastic materials, other than HDPE, including clipboards and waterproof notebooks.
 - Wash hands after handling any food containers or packages as these may contain PFCs.
 - Keep pre-wrapped food containers and wrappers isolated from fish handling.
 - Wear clothing washed at least six times since purchase.
 - Wear clothing washed without fabric softener.
 - Staff should avoid cosmetics, moisturizers, hand creams and similar products on the day of sampling as many of these products contain PFCs (Fujii et al. 2013). Sunscreen or insect repellent should not contain ingredients with “fluor” in their name. Apply any sunscreen or insect repellent well downwind from all materials. Hands must be washed after touching any of these products.
- I. All fish must be kept at a temperature <45° F (<8° C) immediately following data processing. As soon as possible, freeze at -20° C ± 5° C. Due to occasional freezer failures, daily freezer temperature logs are required. The freezer should be locked or otherwise secured to maintain chain of custody.
- J. In most cases, samples should be delivered to the Analytical Services Unit at the Hale Creek field station. Coordinate delivery with field station staff and send copies of the collection records, continuity of evidence forms and freezer temperature logs to the field station. For samples to be analyzed elsewhere, non-routine collections or other questions, contact Wayne Richter, Bureau of Ecosystem Health, NYSDEC, 625 Broadway, Albany, New York 12233-4756, 518-402-8974, or the project leader about sample transfer. Samples will then be directed to the analytical facility and personnel noted on specific project descriptions.
- K. A recommended equipment list is at the end of this document.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF FISH AND WILDLIFE
FISH COLLECTION RECORD

page _____ of _____

Project and Site Name _____ DEC Region _____

Collections made by (include all crew) _____

Sampling Method: ☐ Electrofishing ☐ Gill netting ☐ Trap netting ☐ Trawling ☐ Seining ☐ Angling ☐ Other _____

Preservation Method: ☐ Freezing ☐ Other _____ Notes (SWFDB survey number): _____

FOR LAB USE ONLY- LAB ENTRY NO.	COLLECTION OR TAG NO.	SPECIES	DATE TAKEN	LOCATION	AGE	SEX &/OR REPROD. CONDIT	LENGTH ()	WEIGHT ()	REMARKS

richter: revised 2011, 5/7/15, 10/4/16, 3/20/17; becker: 3/23/17, 4/26/19

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION CHAIN OF CUSTODY

I, _____, of _____ collected the
(Print Name) (Print Business Address)

following on _____, 20____ from _____
(Date) (Water Body)

in the vicinity of _____
(Landmark, Village, Road, etc.)

Town of _____, in _____ County.

Item(s) _____

Said sample(s) were in my possession and handled according to standard procedures provided to me prior to collection. The sample(s) were placed in the custody of a representative of the New York State Department of Environmental Conservation on _____, 20____.

_____ Signature _____ Date

I, _____, received the above mentioned sample(s) on the date specified and assigned identification number(s) _____ to the sample(s). I have recorded pertinent data for the sample(s) on the attached collection records. The sample(s) remained in my custody until subsequently transferred, prepared or shipped at times and on dates as attested to below.

_____ Signature _____ Date

SECOND RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
THIRD RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
FOURTH RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
RECEIVED IN LABORATORY BY (Print Name)	TIME & DATE	REMARKS
SIGNATURE	UNIT	
LOGGED IN BY (Print Name)	TIME & DATE	ACCESSION NUMBERS
SIGNATURE	UNIT	

NOTICE OF WARRANTY

By signature to the chain of custody (reverse), the signatory warrants that the information provided is truthful and accurate to the best of his/her ability. The signatory affirms that he/she is willing to testify to those facts provided and the circumstances surrounding the same. Nothing in this warranty or chain of custody negates responsibility nor liability of the signatories for the truthfulness and accuracy of the statements provided.

HANDLING INSTRUCTIONS

On day of collection, collector(s) name(s), address(es), date, geographic location of capture (attach a copy of topographic map or navigation chart), species, number kept of each species, and description of capture vicinity (proper noun, if possible) along with name of Town and County must be indicated on reverse.

Retain organisms in manila tagged plastic bags to avoid mixing capture locations. Note appropriate information on each bag tag.

Keep samples as cool as possible. Put on ice if fish cannot be frozen within 12 hours. If fish are held more than 24 hours without freezing, they will not be retained or analyzed.

Initial recipient (either DEC or designated agent) of samples from collector(s) is responsible for obtaining and recording information on the collection record forms which will accompany the chain of custody. This person will seal the container using packing tape and writing his signature, the time and the date across the tape onto the container with indelible marker. Any time a seal is broken, for whatever purpose, the incident must be recorded on the Chain of Custody (reason, time, and date) in the purpose of transfer block. Container then is resealed using new tape and rewriting signature, with time and date.

EQUIPMENT LIST

Scale or balance of appropriate capacity for the fish to be collected.

Fish measuring board.

Plastic bags of an appropriate size for the fish to be collected and for site bags.

Individually numbered metal tags for fish.

Manila tags to label bags.

Small envelopes, approximately 2" x 3.5", if fish scales are to be collected.

Knife for removing scales.

Chain of custody and fish collection forms.

Clipboard.

Pens or markers.

Paper towels.

Dish soap and brush.

Bucket.

Cooler.

Ice.

Duct tape.

Appendix G – PFAS Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonic acids	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluoropentanesulfonic acid	PFPeS	2706-91-4
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorononanesulfonic acid	PFNS	68259-12-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
	Perfluorododecanesulfonic acid	PFDoS	79780-39-5
Perfluoroalkyl carboxylic acids	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUnA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTeDA	376-06-7
Per- and Polyfluoroether carboxylic acids	Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
	4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
	Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
	Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
	Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
Fluorotelomer sulfonic acids	4:2 Fluorotelomer sulfonic acid	4:2-FTS	757124-72-4
	6:2 Fluorotelomer sulfonic acid	6:2-FTS	27619-97-2
	8:2 Fluorotelomer sulfonic acid	8:2-FTS	39108-34-4
Fluorotelomer carboxylic acids	3:3 Fluorotelomer carboxylic acid	3:3 FTCA	356-02-5
	5:3 Fluorotelomer carboxylic acid	5:3 FTCA	914637-49-3
	7:3 Fluorotelomer carboxylic acid	7:3 FTCA	812-70-4
Perfluorooctane sulfonamides	Perfluorooctane sulfonamide	PFOSA	754-91-6
	N-methylperfluorooctane sulfonamide	NMeFOSA	31506-32-8
	N-ethylperfluorooctane sulfonamide	NEtFOSA	4151-50-2
Perfluorooctane sulfonamidoacetic acids	N-methylperfluorooctane sulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethylperfluorooctane sulfonamidoacetic acid	N-EtFOSAA	2991-50-6
Perfluorooctane sulfonamide ethanols	N-methylperfluorooctane sulfonamidoethanol	MeFOSE	24448-09-7
	N-ethylperfluorooctane sulfonamidoethanol	EtFOSE	1691-99-2

Group	Chemical Name	Abbreviation	CAS Number
Ether sulfonic acids	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major)	9Cl-PF3ONS	756426-58-1
	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	11Cl-PF3OUdS	763051-92-9
	Perfluoro(2-ethoxyethane) sulfonic acid	PFEESA	113507-82-7

Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

These guidelines are intended to be used for the validation of PFAS using EPA Method 1633 for projects within the Division of Environmental Remediation (DER). Data reviewers should understand the methodology and techniques utilized in the analysis. Consultation with the end user of the data may be necessary to assist in determining data usability based on the data quality objectives in the Quality Assurance Project Plan. A familiarity with the laboratory's Standard Operating Procedure may also be needed to fully evaluate the data. If you have any questions, please contact DER's Quality Assurance Officer, Dana Barbarossa, at dana.barbarossa@dec.ny.gov.

Preservation and Holding Time

Samples should be preserved with ice to a temperature of less than 6°C upon arrival at the lab. The holding time is 28 days to extraction for aqueous and solid samples. The time from extraction to analysis for aqueous samples is 28 days and 40 days for solids.

Temperature greatly exceeds 6°C upon arrival at the lab*	Use professional judgement to qualify detects and non-detects as estimated or rejected
Holding time exceeding 28 days to extraction	Use professional judgement to qualify detects and non-detects as estimated or rejected if holding time is grossly exceeded

*Samples that are delivered to the lab immediately after sampling may not meet the thermal preservation guidelines. Samples are considered acceptable if they arrive on ice or an attempt to chill the samples is observed.

Initial Calibration

The initial calibration should contain a minimum of six standards for linear fit and six standards for a quadratic fit. The relative standard deviation (RSD) for a quadratic fit calibration should be less than 20%.

The low-level calibration standard should be within 50% - 150% of the true value, and the mid-level calibration standard within 70% - 130% of the true value.

%RSD >20%	J flag detects and UJ non detects
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Continuing Calibration Verification

Continuing calibration verification (CCV) checks should be analyzed at a frequency of one per ten field samples. If CCV recovery is very low, where detection of the analyte could be in question, ensure a low level CCV was analyzed and use to determine data quality.

CCV recovery <70 or >130%	J flag results
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Blanks

There should be no detections in the method blanks above the reporting limits. Equipment blanks, field blanks, rinse blanks etc. should be evaluated in the same manner as method blanks. Use the most contaminated blank to evaluate the sample results.

Blank Result	Sample Result	Qualification
Any detection	<Reporting limit	Qualify as ND at reporting limit
Any detection	>Reporting Limit and >10x the blank result	No qualification
>Reporting limit	>Reporting limit and <10x blank result	J+ biased high

Field Duplicates

A blind field duplicate should be collected at rate of one per twenty samples. The relative percent difference (RPD) should be less than 30% for analyte concentrations greater than two times the reporting limit. Use the higher result for final reporting.

RPD >30%	Apply J qualifier to parent sample
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Lab Control Spike

Lab control spikes should be analyzed with each extraction batch or one for every twenty samples. In the absence of lab derived criteria, use 70% - 130% recovery criteria to evaluate the data.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects
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Matrix Spike/Matrix Spike Duplicate

One matrix spike and matrix spike duplicate should be collected at a rate of one per twenty samples. Use professional judgement to reject results based on out of control MS/MSD recoveries.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only
RPD >30%	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only

Extracted Internal Standards (Isotope Dilution Analytes)

Problematic analytes (e.g. PFBA, PFPeA, fluorotelomer sulfonates) can have wider recoveries without qualification. Qualify corresponding native compounds with a J flag if outside of the range.

Recovery <50% or >150%	Apply J qualifier
Recovery <25% or >150% for poor responding analytes	Apply J qualifier
Isotope Dilution Analyte (IDA) Recovery <10%	Reject results

Signal to Noise Ratio

The signal to noise ratio for the quantifier ion should be at least 3:1. If the ratio is less than 3:1, the peak is discernable from the baseline noise and symmetrical, the result can be reported. If the peak appears to be baseline noise and/or the shape is irregular, qualify the result as tentatively identified.

Reporting Limits

If project-specific reporting limits were not met, please indicate that in the report along with the reason (e.g. over dilution, dilution for non-target analytes, high sediment in aqueous samples).

Peak Integrations

Target analyte peaks should be integrated properly and consistently when compared to standards. Ensure branched isomer peaks are included for PFAS where standards are available. Inconsistencies should be brought to the attention of the laboratory or identified in the data review summary report.

7.0 DISPOSAL

Waste generated by this process will be disposed of in accordance with Federal, State and Local regulations and SOP 'Investigative Derived Waste'. Where reasonably feasible, technological changes have been implemented to minimize the potential for environmental pollution.

8.0 RECORDS

Records should be documented on the Environmental Services Field Logs and Subsurface Exploration Logs.

9.0 DEFINITIONS

Discrete soil sample: A discrete aliquot from a distinct sampling interval (of a specific sample size) that is representative of one specific location at a specific point in time.

Surface soil: Generally considered to be the top 6 inches of a soil horizon profile (that is, soil from 0 to 6 inches bgs), soil down to depths of 2 feet bgs may be considered surface and/or near-surface soil.

Subsurface soil: The soils below surface soil.

APPENDIX B
**APPLICABLE NYS STANDARDS, CRITERIA
AND GUIDANCE**

(b) Restricted use soil cleanup objectives.

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Metals							
Arsenic	7440-38-2	16 ^f	16 ^f	16 ^f	16 ^f	13 ^f	16 ^f
Barium	7440-39-3	350 ^f	400	400	10,000 ^d	433	820
Beryllium	7440-41-7	14	72	590	2,700	10	47
Cadmium	7440-43-9	2.5 ^f	4.3	9.3	60	4	7.5
Chromium, hexavalent ^h	18540-29-9	22	110	400	800	1 ^e	19
Chromium, trivalent ^h	16065-83-1	36	180	1,500	6,800	41	NS
Copper	7440-50-8	270	270	270	10,000 ^d	50	1,720
Total Cyanide ^h		27	27	27	10,000 ^d	NS	40
Lead	7439-92-1	400	400	1,000	3,900	63 ^f	450
Manganese	7439-96-5	2,000 ^f	2,000 ^f	10,000 ^d	10,000 ^d	1600 ^f	2,000 ^f
Total Mercury		0.81 ^j	0.81 ^j	2.8 ^j	5.7 ^j	0.18 ^f	0.73
Nickel	7440-02-0	140	310	310	10,000 ^d	30	130
Selenium	7782-49-2	36	180	1,500	6,800	3.9 ^f	4 ^f
Silver	7440-22-4	36	180	1,500	6,800	2	8.3
Zinc	7440-66-6	2200	10,000 ^d	10,000 ^d	10,000 ^d	109 ^f	2,480
PCBs/Pesticides							
2,4,5-TP Acid (Silvex)	93-72-1	58	100 ^a	500 ^b	1,000 ^c	NS	3.8
4,4'-DDE	72-55-9	1.8	8.9	62	120	0.0033 ^e	17
4,4'-DDT	50-29-3	1.7	7.9	47	94	0.0033 ^e	136
4,4'- DDD	72-54-8	2.6	13	92	180	0.0033 ^e	14
Aldrin	309-00-2	0.019	0.097	0.68	1.4	0.14	0.19
alpha-BHC	319-84-6	0.097	0.48	3.4	6.8	0.04 ^g	0.02
beta-BHC	319-85-7	0.072	0.36	3	14	0.6	0.09
Chlordane (alpha)	5103-71-9	0.91	4.2	24	47	1.3	2.9

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
delta-BHC	319-86-8	100 ^a	100 ^a	500 ^b	1,000 ^c	0.04 ^g	0.25
Dibenzofuran	132-64-9	14	59	350	1,000 ^c	NS	210
Dieldrin	60-57-1	0.039	0.2	1.4	2.8	0.006	0.1
Endosulfan I	959-98-8	4.8 ⁱ	24 ⁱ	200 ⁱ	920 ⁱ	NS	102
Endosulfan II	33213-65-9	4.8 ⁱ	24 ⁱ	200 ⁱ	920 ⁱ	NS	102
Endosulfan sulfate	1031-07-8	4.8 ⁱ	24 ⁱ	200 ⁱ	920 ⁱ	NS	1,000 ^c
Endrin	72-20-8	2.2	11	89	410	0.014	0.06
Heptachlor	76-44-8	0.42	2.1	15	29	0.14	0.38
Lindane	58-89-9	0.28	1.3	9.2	23	6	0.1
Polychlorinated biphenyls	1336-36-3	1	1	1	25	1	3.2
Semivolatiles							
Acenaphthene	83-32-9	100 ^a	100 ^a	500 ^b	1,000 ^c	20	98
Acenaphthylene	208-96-8	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	107
Anthracene	120-12-7	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1,000 ^c
Benz(a)anthracene	56-55-3	1 ^f	1 ^f	5.6	11	NS	1 ^f
Benzo(a)pyrene	50-32-8	1 ^f	1 ^f	1 ^f	1.1	2.6	22
Benzo(b)fluoranthene	205-99-2	1 ^f	1 ^f	5.6	11	NS	1.7
Benzo(g,h,i)perylene	191-24-2	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1,000 ^c
Benzo(k)fluoranthene	207-08-9	1	3.9	56	110	NS	1.7
Chrysene	218-01-9	1 ^f	3.9	56	110	NS	1 ^f
Dibenz(a,h)anthracene	53-70-3	0.33 ^e	0.33 ^e	0.56	1.1	NS	1,000 ^c
Fluoranthene	206-44-0	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1,000 ^c
Fluorene	86-73-7	100 ^a	100 ^a	500 ^b	1,000 ^c	30	386
Indeno(1,2,3-cd)pyrene	193-39-5	0.5 ^f	0.5 ^f	5.6	11	NS	8.2
m-Cresol	108-39-4	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	0.33 ^e
Naphthalene	91-20-3	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
o-Cresol	95-48-7	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	0.33 ^e
p-Cresol	106-44-5	34	100 ^a	500 ^b	1,000 ^c	NS	0.33 ^e
Pentachlorophenol	87-86-5	2.4	6.7	6.7	55	0.8 ^e	0.8 ^e
Phenanthrene	85-01-8	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1,000 ^c
Phenol	108-95-2	100 ^a	100 ^a	500 ^b	1,000 ^c	30	0.33 ^e
Pyrene	129-00-0	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1,000 ^c
Volatiles							
1,1,1-Trichloroethane	71-55-6	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	0.68
1,1-Dichloroethane	75-34-3	19	26	240	480	NS	0.27
1,1-Dichloroethene	75-35-4	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	0.33
1,2-Dichlorobenzene	95-50-1	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	1.1
1,2-Dichloroethane	107-06-2	2.3	3.1	30	60	10	0.02 ^f
cis-1,2-Dichloroethene	156-59-2	59	100 ^a	500 ^b	1,000 ^c	NS	0.25
trans-1,2-Dichloroethene	156-60-5	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	0.19
1,3-Dichlorobenzene	541-73-1	17	49	280	560	NS	2.4
1,4-Dichlorobenzene	106-46-7	9.8	13	130	250	20	1.8
1,4-Dioxane	123-91-1	9.8	13	130	250	0.1 ^e	0.1 ^e
Acetone	67-64-1	100 ^a	100 ^b	500 ^b	1,000 ^c	2.2	0.05
Benzene	71-43-2	2.9	4.8	44	89	70	0.06
Butylbenzene	104-51-8	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	12
Carbon tetrachloride	56-23-5	1.4	2.4	22	44	NS	0.76
Chlorobenzene	108-90-7	100 ^a	100 ^a	500 ^b	1,000 ^c	40	1.1
Chloroform	67-66-3	10	49	350	700	12	0.37
Ethylbenzene	100-41-4	30	41	390	780	NS	1
Hexachlorobenzene	118-74-1	0.33 ^e	1.2	6	12	NS	3.2
Methyl ethyl ketone	78-93-3	100 ^a	100 ^a	500 ^b	1,000 ^c	100 ^a	0.12

Table 375-6.8(b): Restricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Protection of Public Health				Protection of Ecological Resources	Protection of Ground-water
		Residential	Restricted-Residential	Commercial	Industrial		
Methyl tert-butyl ether	1634-04-4	62	100 ^a	500 ^b	1,000 ^c	NS	0.93
Methylene chloride	75-09-2	51	100 ^a	500 ^b	1,000 ^c	12	0.05
n-Propylbenzene	103-65-1	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	3.9
sec-Butylbenzene	135-98-8	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	11
tert-Butylbenzene	98-06-6	100 ^a	100 ^a	500 ^b	1,000 ^c	NS	5.9
Tetrachloroethene	127-18-4	5.5	19	150	300	2	1.3
Toluene	108-88-3	100 ^a	100 ^a	500 ^b	1,000 ^c	36	0.7
Trichloroethene	79-01-6	10	21	200	400	2	0.47
1,2,4-Trimethylbenzene	95-63-6	47	52	190	380	NS	3.6
1,3,5- Trimethylbenzene	108-67-8	47	52	190	380	NS	8.4
Vinyl chloride	75-01-4	0.21	0.9	13	27	NS	0.02
Xylene (mixed)	1330-20-7	100 ^a	100 ^a	500 ^b	1,000 ^c	0.26	1.6

All soil cleanup objectives (SCOs) are in parts per million (ppm).

NS=Not specified. See [Technical Support Document \(TSD\)](#).

Footnotes

^a The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 ppm. See TSD section 9.3.

^b The SCOs for commercial use were capped at a maximum value of 500 ppm. See TSD section 9.3.

^c The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 ppm. See TSD section 9.3.

^d The SCOs for metals were capped at a maximum value of 10,000 ppm. See TSD section 9.3.

^e For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the SCO value.

^f For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.

^g This SCO is derived from data on mixed isomers of BHC.

^h The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.

ⁱ This SCO is for the sum of endosulfan I, endosulfan II, and endosulfan sulfate.

^j This SCO is the lower of the values for mercury (elemental) or mercury (inorganic salts). See TSD Table 5.6-1.

375-6.9 Development or modification of soil cleanup objectives.

(a) Applicability. This section identifies when and the procedures under which a contaminant-specific soil cleanup objective may be developed or modified.

(1) Soil cleanup objectives for contaminants not included in Tables 375-6.8(a) and (b) may be developed by the remedial party or required by the Department.

(2) Soil cleanup objectives for contaminants included in Tables 375-6.8(a) and (b), may be modified based on site-specific data if desired by the remedial party; as set forth in:

(i) subpart 375-3 for Tracks 3 or 4, as set forth in paragraphs 375-3.8(e)(3) or (4), respectively; or

(ii) subparts 375-2 and 375-4, as set forth in subparagraph 375-2.8(b)(1)(iii) and subparagraph 375-4.8(c)(1)(iii).

(3) Protection of ecological resources soil cleanup objectives were not developed for certain contaminants, which are identified in Table 375-6.8(b) as “NS”. Where such contaminants:

(i) appear in Table 375-6.8(a), the applicant may be required by the Department to calculate a protection of ecological resources soil cleanup objective for the contaminant for use in Track 1 and apply such soil cleanup objective where it is lower than the soil cleanup objective set forth in Table 375-6.8(a); or

(ii) are identified as impacting or threatening an ecological resource for a restricted use remedial program the Department may require a protection of ecological resources soil cleanup objective be developed.

(b) New soil cleanup objectives must:

(1) Be developed utilizing the same methodologies that were used by the Department to develop the respective soil cleanup objective, as provided in the Technical Support Document.

(2) Apply the following caps, as set forth in section 9.3 of the Technical Support Document, on any soil cleanup objective included in Tables 375-6.8(a) and (b), with the exception of metals, as set forth in paragraph (3) below, developed for:

(i) unrestricted use, residential use, restricted-residential use and the protection of ecological resources, a maximum value of 100 ppm;

(ii) commercial use, a maximum value of 500 ppm; and

(iii) industrial use and the protection of groundwater a maximum value of 1000 ppm,

and

(3) Apply a cap for metals at a maximum value of 10,000 ppm.

(c) Development of unrestricted use soil cleanup objectives. The unrestricted use soil cleanup objective for a compound will be the lowest of the soil cleanup values, calculated as set forth in appendix E of the Technical Support Document, for the protection of groundwater, protection of ecological resources and protection of public health.

(d) Development of restricted use soil cleanup objectives. The protection of:

(1) Groundwater soil cleanup objective will be the values calculated for the protection of groundwater as set forth in appendix E of the Technical Support Document;

(2) Ecological resources soil cleanup objectives will be the values calculated for the protection of ecological resources as set forth in appendix E of the Technical Support Document; and

(3) Public health cleanup objective will be the values calculated for the protection of public health for the identified use of the site, as set forth in appendix E of the Technical Support Document.

(e) Modification of soil cleanup objectives. The contaminant-specific soil cleanup objectives set forth at Tables 375-6.8(a) and (b)¹ may be modified by site specific data as set forth in this subdivision.

¹ Original should read “Tables 375-6.8(a) and (b)”

(1) Contaminant-specific soil cleanup objectives modified in accordance with this subdivision may be utilized by the remedial party for a site remedial program undertaken pursuant to:

(i) subpart 375-3 in Tracks 3 or 4, as set forth in paragraphs 375-3.8(e)(3) or (4), respectively; or

(ii) subparts 375-2 and 375-4, as set forth in subparagraph 375-2.8(b)(1)(ii) and subparagraph 375-4.8(c)(1)(ii).

(2) For the calculation of a protection of groundwater or ecological resources contaminant-specific soil cleanup objective, the site-specific percentage of total organic carbon in the soil at the site may be substituted in the algorithms provided in appendix E of the Technical Support Document.

(3) For the calculation of a protection of public health contaminant-specific soil cleanup objective, site-specific data may be used to modify two of the five exposure pathways, as follows:

- (i) for the particulate inhalation pathway six parameters rely on site-specific data; and
- (ii) for the volatile inhalation pathway, four parameters rely on site-specific data.

(4) The algorithms to be used for each protection of public health pathway and details on the parameters which can be substituted are included in appendix E of the Technical Support Document.

(f) Use of soil cleanup objectives developed or modified. Once approved by the Department, contaminant-specific soil cleanup objectives developed or modified as set forth in this section may be utilized by the Department at other sites consistent with paragraphs (1) and (2) below.

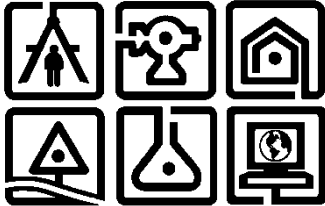
(1) Contaminant-specific soil cleanup objectives developed for contaminants not included in Tables 375-6.8(a) and (b), as set forth in subdivision 375-6.9(b) above, will be used as guidance and shall be considered by the Department for inclusion in the Tables in this subpart during any subsequent reevaluation of the soil cleanup objectives, as set forth by ECL 27-1415.

(2) Contaminant-specific soil cleanup objectives modified for site specific parameters, as set forth in subdivision 375-6.9(e) above, may be utilized at sites manifesting similar parameters, if approved by the Department.

APPENDIX C
**HEALTH AND SAFETY PLAN
FOR C.T. MALE EMPLOYEES**

April 29, 2022

NYS Brownfield Cleanup Program



Site-Specific Health & Safety Plan Remedial Action

5 Scobie Drive
City of Newburgh
Orange County, New York
BCP No. C336085

Prepared by:

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C.T. Male Project No: 19.9405

**SITE-SPECIFIC HEALTH & SAFETY PLAN
5 SCOBIE DRIVE, CITY OF NEWBURGH
ORANGE COUNTY, NEW YORK**

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FIGURES

Figure 1: Site Location Map

Figure 2: Map Showing Route to St. Luke's Cornwall Hospital

1.0 GENERAL

1.1 Overview

This Site-specific Health and Safety Plan (HASP) has been prepared for use during implementation of the Remedial Action (RA) at the 5 Scobie Drive Site (“the Site”) located in the City of Newburgh, Orange County, New York. This HASP has been developed as an integral part of the RA Work Plan (RAWP) as prepared by C.T. Male Associates Engineering, Surveying, Architecture & Landscape Architecture D.P.C. (C.T. Male). The RA is being performed under the NYS Brownfield Cleanup Program (BCP Site No. C336085).

This HASP is written to follow the regulatory requirements and guidelines in the following:

- 29 CFR 1910, OSHA, Safety and Health Regulations for General Industry.
- C.T. Male Associates Health and Safety Manual.
- Federal, State, County, and local guidance on Airborne Infectious Disease and COVID-19.

A designated Office Health and Safety Officer (OHSO) will be responsible for implementing this HASP during the completion of the field work. A designated Site Health and Safety Officer (SHSO) will be responsible for implementing this HASP during the completion of the field work. C.T. Male employees who enter the work area (support, decontamination, exclusion zone) must review, sign and comply with this HASP. A list of individuals authorized to enter the Site is presented in Section 13.0 of this HASP. Subcontractors retained by either C.T. Male or Scobie Industrial Partners, LLC (Volunteer in the BCP) will be required to prepare their own HASP for implementation by their employees, personnel and subcontractors. A copy of this Site-specific HASP will be maintained at the work area throughout the duration of the project.

A complete description of the RA work is presented in the RA Work Plan. A brief description of the proposed scope of work is outlined below.

Remedial Action Activities:

- Excavation, clearing, and grading across the Site;
- Subsurface investigation, test pits/borings;
- Collect environmental samples (soil, groundwater, etc.);
- Site survey;
- Foundation installation and subgrade improvements;
- Building and utilities construction;
- Installation of stormwater management facilities;
- Relocation of wastes on the 5 Scobie Drive Site (no off-site waste materials will be brought onto the 5 Scobie Drive Site);
- Site restoration;
- Waste relocation/disposal or other activities resulting in excavation into waste;
- Management of unexpected drums or other hazardous wastes; and
- Other unforeseen environmental conditions which may be encountered during work activities.

This HASP will be implemented throughout the duration of the remedial action or subsequent environmental monitoring activities following the RA.

1.2 Contact Names & Numbers

For this project, the following NYSDEC, City of Newburgh, and Emergency Response names and telephone numbers are presented below as site contacts.

NYSDEC CONTACTS:

PROJECT MANAGER:	Kiera Thompson, P.G. Project Manager NYS Department of Environmental Conservation Division of Environmental Remediation 625 Broadway, 11th Floor Albany, NY 12233-7014	(518) 402-9662
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C.T. MALE ASSOCIATES

NYSDOH CONTACT:

TECHNICAL LEAD: Kristin Kulow (607) 432-3911
NYSDOH-Oneonta District Office
28 Hill Street, Suite 201
Oneonta, New York 13820

CITY OF NEWBURGH CONTACTS:

OWNER REPRESENTATIVE: Mr. Jason Morris (845) 569-7448
City of Newburgh
83 Broadway
Newburgh, New York 12550

CONSULTANT CONTACTS:

CONSULTING C.T. Male Associates (845) 454-4400
ENGINEER: 12 Raymond Avenue,
Poughkeepsie, New York 12603

Daniel P. Reilly, P.E., Project Principal (518) 786-7625 (O)
(518) 928-9792 (C)

Jim McIver, P.G., Project Manager (845)-454-4400 (O)
(845) 594-1788 (C)

Nancy Garry, P.E., CSP (518) 786-7541 (O)
Office Health & Safety Officer (518) 320-5783 (C)

To be determined, based on field staff onsite
Site Health & Safety Officer (HSO)

EMERGENCY PHONE NUMBERS:

PERSONAL INJURY St. Luke's Cornwall Hospital (845) 568-2351
OR EMERGENCY: 70 Dubois Street
Newburgh, NY 12550

C.T. MALE ASSOCIATES

FIRE DEPARTMENT:	Emergency City of Newburgh Fire Department 22 Grand Street Newburgh, NY 12550	911 (845) 562-1212
POLICE:	Emergency City of Newburgh Police Department 55 Broadway Newburgh, NY 12550	911 (845) 561-3131
	Emergency NYS Troopers Barracks 55 Crystal Run Road Middletown, NY 10941-9755	911 (845) 344-5300
UPSTATE NEW YORK REGIONAL POISON CONTROL CENTER:	University Hospital Upstate Medical University SUNY Health Science Center 750 East Adams Street Syracuse, NY 13201	(800) 222-1222
NATIONAL RESPONSE CENTER:	c/o United States Coast Guard (G-OPF) 2100 2nd Street, Southwest - Room 2611 Washington, DC 20593-0001	(800) 424-8802
NYSDEC SPILL HOTLINE:		(800) 457-7362

2.0 HEALTH AND SAFETY PERSONNEL

The Office Health and Safety Officer (OHSO) will be responsible for implementing C.T. Male's health and safety policies and to ensure field work follows C.T. Male policies.

The Site Health and Safety Officer (SHSO) or designee will be responsible for implementation of the HASP and the delegation of health and safety duties. The SHSO will coordinate the resolution of safety issues that arise during Site work or ask the OSHO, and/or Project Manager for direction and compliance of the situation. When the SHSO is not present on-Site, a designee will be authorized to perform the duties of the SHSO. The designee will be responsible for implementation of the HASP.

The SHSO or designee has stop work authorization upon their determination of an imminent safety hazard, emergency situation or other potentially dangerous situations (e.g. weather conditions), when this action is deemed appropriate. Authorization to resume work will be issued by the OSHO, Project Manager or the SHSO.

3.0 SITE LOCATION AND DESCRIPTION

The subject Site is located at 5 Scobie Drive in the City of Newburgh, Orange County, New York. The Site consists of one (1) tax parcel (S.B.L. 1-1-6) and is approximately 15.6 acres in size. The Site is located to the northeast of the former DuPont-Stauffer Chemical Manufacturing site and the City Department of Public Works (DPW) facility, west of Scobie Drive and two (2) ongoing commercial enterprises, and south of Interstate I-84 (Figure 1). The Site is entered from Scobie Drive. Access to the Site by vehicle is restricted by the absence of a stabilized entrance. The Site area topography is generally slopes to the north with some flatter spots with a slight downward grade to the north and east.

The Site is currently vacant and had historically been used as a landfill. Buildings are not present within the Site. The Site is currently overgrown. Stockpiles and scattered junkyard type objects (i.e., empty containers, tanks, empty drums, car parts, televisions, refrigerator carcasses, etc.) are present on the southern portion of the Site, adjacent to the City-owned DPW site. Some of the debris may be from convenience dumping. A pile of wood chips located in the southeastern portion of the Site generated during previous Site clearing activities.

No utilities are currently present on-site. However, the region is serviced with electricity and natural gas from Central Hudson Gas and Electric, and municipal water and sewer.

A shallow drainage ditch that appears to be manmade exists along the northern boundary of the Site. Federal wetlands are located along the drainage ditch and on the northern edge of the Site. The drainage swale on the northeastern side of the Site drains generally east to west-northwest into the wetlands on the northern edge of the Site. The drainage swale collects water from the adjacent commercial facilities located to the north and east of the property and from a portion of the residential development located on the east side of 5 Scobie Drive. The water course observed in the wetland flows east to west and is partially located along the northern Site boundary, existing between the Site and Interstate I-84. The water eventually flows into the Gidneytown Creek, located approximately 1,000 feet west of the wetlands to the north and west of the Site.

4.0 KNOWN AND POTENTIAL SITE CONTAMINANTS

Site contaminants identified during the RI, above their respective standards/guidance values include the following:

Surface Soils

- Semi-volatile organic compounds (SVOCs) (Benzo(a)pyrene); and
- Metal (Arsenic).

Subsurface Soils

- SVOCs (Benzo(a)pyrene); and
- Metals (Arsenic, Lead and Mercury).

Groundwater

- Anions (Bromide and Chloride);
- Volatile organic compounds (VOCs) (Chlorobenzene, Benzene, 1,4-Dichlorobenzene, and Naphthalene);
- SVOCs (1,4-Dichlorobenzene, Bis(2-Ethylhexyl)phthalate, Naphthalene, Benzo(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene and Chrysene);
- Metals (Antimony, Boron, Iron, Lead, Magnesium, Manganese and Sodium);
- PCBs (Aroclors 1242 and 1254); and
- Per and Polyfluoroalkyl Substances (PFAS).

Surface Water

- SVOCs (Benzo(a)pyrene, Benzo(b)fluoranthene and Chrysene);
- Metals (Aluminum, Antimony, Cobalt, Iron, Magnesium, Manganese and Vanadium); and
- Per and Polyfluoroalkyl Substances (PFAS).

Sediment

- Metals (Arsenic, Silver and Zinc).

Previous environmental investigations have also encountered petroleum-range hydrocarbons and surface debris. Other VOCs, SVOCs, metals, pesticides, PCBs and PFAS compounds have the potential to be present in surface soil, subsurface soil, sediment, surface water and groundwater.

4.1 Potential Exposure Pathways

Occupational exposure to chemical hazards associated with the work activities could potentially occur by dermal contact (skin contact), inhalation and an indirect route (incidental ingestion).

4.1.1 Dermal Contact

The primary route of potential exposure for C.T. Male employees is dermal contact. Personnel walking or handling associated equipment may be exposed to chemical hazards by skin contact or adsorption. In addition, personnel have the potential to be exposed to landfill waste due to excavation and regrading activities due to the nature of the Site as a former landfill. However, exposure is expected to be limited since workers will be required to wear appropriate personal protective equipment (PPE) (i.e. appropriate work gloves, shoes, clothing, and safety glasses).

4.1.2 Ingestion

Personnel handling of associated equipment, including project hazardous materials, could be exposed by incidental ingestion. Typically, this exposure occurs if proper PPE is not used or personal hygiene was not practiced. Personal protection against exposure via ingestion can be accomplished by performance of proper decontamination procedures when exiting contaminated work areas as well as using the correct PPE.

4.1.3 Inhalation

Personnel handling of associated equipment, including project hazardous materials, could be exposed by incidental inhalation. Due to the nature of the Site as a former landfill and uncovering of waste material personnel might be exposed to gases and vapors. If a potential inhalation hazard is noted on-Site, C.T. Male staff will immediately stop work and take the appropriate steps to notify SHSO, PM or OHSO. The work being conducted will be reevaluated to determine the potential exposure and further PPE that may be needed.

5.0 HAZARD ASSESSMENT

5.1 General

The hazard assessment, use of specific protective equipment, and monitoring associated with each field work task of the RA to be conducted at the subject Site are presented in following subsections.

For this project, C.T. Male and the Applicant will be contracting/subcontracting portions of the RA activities. Each contractor/subcontractor will be responsible for developing and implementing a Site-specific health and safety plan for their activities, for protection of their employees, and use of personal protective equipment. The construction contractors and subcontractors health and safety plans shall be submitted to C.T. Male prior to the work beginning. In addition, if there are training or professional certificates required for the project as per OSHA or other applicable regulations, the subcontractor(s) shall provide copies of certificates to C.T. Male before work begins. The contractor/subcontractor will also be responsible for developing and following their own Respiratory Protection Program, as applicable.

5.2 Site Survey

The potential hazards during surveying include slip and fall hazards from potentially uneven terrain. To protect against these potential hazards, any personnel completing this work should wear, at a minimum: ASTM approved steel or composite toe boots, Type R/Class 2 safety vest (ANSI/ISEA 107-2015 or 107-2020), hard hat, safety glasses, and microspikes as needed. Refer to Table 2 for potential hazards and controls associated with slip, trips, and falls.

5.3 Excavation, Grading, and Site Clearing / Building and Utility Construction

The potential hazards to personnel during this work are slip/trip/fall, excavations, working around construction & subsurface investigation machinery (hit /struck by), dermal contact and vapor inhalation of potential site contaminants. Level D protection should be sufficient to protect against these potential hazards.

5.4 Soil, Sediment, Groundwater and Surface Water Sampling

Soil and groundwater sampling are planned for the Site. Sediment and surface water sampling has a potential to be sampled but is not planned at this time. The potential hazards to personnel during this work are dermal contact and vapor inhalation of potential site contaminants. Level D protection should be sufficient to protect against dermal contact. If organic vapors are present at the action levels described in Section 5.6, on the basis of organic vapor monitoring of the area during the work, it may be necessary to upgrade to Level C respiratory protection. There is a potential for explosive gas, due to the Sites previous use as a landfill. A landfill gas meter will be utilized during work activities. If gas is detected by the landfill meter, the SHSO shall review the levels and follow the steps in Section 5.6. This may include work stopping or adjust of work areas.

5.5 Subsurface Work

Subsurface work will include the advancement of test pits and/or test borings to aid in the collection of fill/soil samples for disposal facility waste characterization; the decommissioning of monitoring wells; the excavation and temporary staging and/or direct load-out of fill/soil for off-site disposal; excavation; grading groundwater dewatering, treatment and disposal. Other subsurface work may include the relocation of wastes.

The potential hazards to personnel during this work are dermal contact and potential for vapor inhalation of potential site contaminants. Level D protection should be sufficient to protect against dermal contact during excavation of and/or handling of the subsurface soils and groundwater. If organic vapors are present at the action levels described in Section 5.6, on the basis of organic vapor monitoring of the area during the work, it may be necessary to upgrade to Level C respiratory protection. There is a potential for explosive gas, due to the Sites previous use as a landfill. A landfill gas meter will be utilized during work activities. If gas is detected by the landfill meter, the SHSO shall review the levels and follow the steps in Section 5.6. This may include work stopping or adjust of work areas.

There is a potential for encountering unexpected drums and other unforeseen environmental conditions, including but not limited to hazardous wastes, during

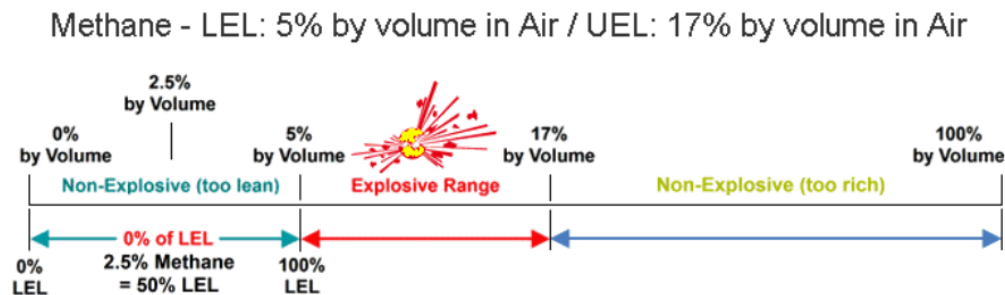
grading activities and subsurface activities. If these conditions are encountered, workers shall shut down equipment and leave the area immediately. The OHSO and SHSO will be notified of the finding and the work activity will be evaluated.

5.6 Air Monitoring

5.6.1 Landfill Gas Monitoring

The ambient air in the work area will be monitored with a gas meter (e.g., four gas meter, landfill gas monitor) that can detect at least methane and oxygen content. The instrument shall have preliminary checks completed as per manufacturer's instructions prior to using to take readings.

If the methane reading by volume reaches 1.0 to 1.25%, activities at the Site work zone are to cease, workers should leave the work zone. The Site activities will be reviewed and evaluated by the PM and/or OSHO prior to work activities restarting. The lower explosive limit for methane gas by volume is 5%. The explosive range for methane is 5% to 17% by volume.



The readings for Oxygen shall be in the range of 20.9% and 21%. If the readings are not within that range, work is to cease, and a review of site activities will be evaluated by the PM and/or OSHO.

5.6.2 VOC Monitoring

The ambient air in the work area will be monitored with a photoionization detection meter (PID, total volatile compound – MiniRAE 3000 or equivalent personal wearable

unit) on a continuous full-time basis. If a concentration of 10 parts per million (ppm) sustained for 5 minutes of total volatile compounds is detected within the work area on the instrument, relative to an isobutylene standard (used to calibrate the instrument), the workers shall leave the area immediately. C.T. Male shall immediately notify the site foreman, superintendent or construction manager leading the excavation activity of our findings. The level of personal protective equipment (PPE) protection for C.T. Male employees will be evaluated prior to continuing observation work. If a PPE upgrade to Level C is required, it will include: a half face air purifying respirator equipped with combination organic vapor and particulate cartridges for 10-15 ppm exposure levels; and a full-face air purifying respirator for greater than 15 ppm to less than 50 ppm exposure levels, prior to continuing work. If a concentration greater than 50 ppm is encountered, work will cease immediately and the situation will be evaluated prior to continuation of work. Table 5.6.2-1 summarizes the action levels relative to the required respiratory protection.

Table 5.6.2-1 - C.T. Male Action Levels & Required Respiratory Protection		
Action Level	Level of PPE	Type of Respiratory Protection
0-10 parts per million	Level D	No respiratory protection
10-15 parts per million	Level C	Negative pressure half-face respirator
15-50 parts per million	Level C	Positive pressure full-face respirator
Greater than 50	Cease Work	Evaluate work procedures

-Facial hair is not permitted while wearing most respirators.

-Workers required to wear a respirator must have a minimum of OSHA 40 Hour training with current medical monitoring and fit test documentation.

5.7 Community Air Monitoring Plan

A Community Air Monitoring Plan (CAMP) will be followed for the project on the basis of the New York State Department of Health Generic Community Air Monitoring Plan dated May 2010. CAMP will be employed during ground intrusive activities having the ability to disturb the Site's fill/soil during the RA. These include the advancement of test pits and test borings and impacted fill/soil excavation/handling.

The intent of the CAMP is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site

workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of remedial work activities. The CAMP is not intended for use in establishing action levels for worker respiratory protection. The CAMP will monitor the air for dust (particulate air monitoring, see Section 5.6.1) and volatile organic compound vapors (VOC air monitoring, see Section 5.6.2) at the downwind perimeter of the work area. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown.

5.7.1 Particulate Air Monitoring

Three (3) real-time particulate monitors capable of continuously measuring concentrations of particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) will be utilized. The instruments will be placed inside environmental enclosures at temporary monitoring stations based on the prevailing wind direction each work day, one (1) upwind and two (2) downwind of the designated work areas. If the remedial action is taking place within 20 feet of occupied structures, monitoring will be conducted opposite the walls of the occupied structures or next to the structures' air intake vents.

Each particulate monitor will be equipped with a telemetry unit capable of transmitting real-time particulate data. The particulate monitoring instruments will be capable of displaying and transmitting the short term exposure limit (STEL) or 15 minute averaging period, which will be compared to the NYSDOH Generic and Special Requirements Community Air Monitoring Plan action levels for particulates, as listed below. Instrument alarms will be transmitted in real time to the Remediation Engineer and/or the Remediation Engineer's field representative via email and/or text message. The dust monitoring data for the remedial action will be stored in the Environet database and will be periodically downloaded and stored in C.T. Male's electronic project directory.

- If the downwind and/or occupied structures PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that the downwind and/or occupied structures PM-10 particulate levels do not exceed 150

mcg/m³ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, the downwind and/or occupied structures PM-10 particulate levels are greater than 150 mcg/m³ above the upwind level, work must be stopped, and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind and/or occupied structures PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration.

In the event of poor weather such as heavy rain, particulate monitoring will not be performed for protection of instrumentation. These weather conditions would limit the effectiveness of the sensitive monitoring equipment and likely suppress particulate generation. Work activities will be halted if fugitive dust migration is visually observed for a sustained period of time during poor weather conditions.

5.7.2 Volatile Organic Compound Air Monitoring

C.T. Male will continuously monitor for VOCs at the downwind perimeter of the immediate work areas and/or occupied structures with a MiniRAE 3000 VOC monitor (10.6 eV lamp) or equal. The VOC monitors will be placed in the downwind and occupied structures environmental enclosures containing a particulate monitor. The downwind VOC monitors will be equipped with telemetry units capable of transmitting real-time VOC data. The VOC monitoring instruments will be capable of displaying and transmitting the short term exposure limit (STEL) or 15 minute averaging period, which will be compared to the NYSDOH Generic Community Air Monitoring Plan action levels for VOCs, as listed below. The monitoring data for the remedial action will be downloaded to a PC and retained for future reference and reporting.

Upwind VOC STEL concentrations will be measured at the start of the work day and periodically thereafter employing a handheld MiniRae 3000 VOC monitor (10.6 eV lamp) to evaluate the Site's background conditions. The upwind VOC STEL readings will be manually recorded for future reference and reporting.

- If the ambient air concentration of total organic vapors opposite the walls of occupied structures exceeds 1 ppm above background for the 15-minute average, work activities will be temporarily halted, and monitoring will be conducted within the occupied structure.
- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone (not including the occupied structures) exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone (not including the occupied structures) persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown. Work activities will then be evaluated to determine the source of the organic vapors and the engineering controls required to reduce/eliminate the organic vapors.

5.8 Hazard Identification and Control

The following table presents generalized hazards potentially involved with the tasks to be completed on this project. Table 5.6-1 identifies general procedures to follow to prevent or reduce accident, injury or illness. Any worker on-site who identifies a potential hazard must report the condition to the SHSO and OHSO or designee, and initiate control of the hazardous condition.

Biological Hazards

During the Site walk through for the project task, the area will be screened for biological hazards. The most common hazards anticipated are discussed below.

Insects

Bees, wasps, yellow jackets, spiders, snakes, and mosquitoes may be a potential hazard on this project, especially so for those individuals sensitized to those bites or stings. Protection methods against insects may be employed, such as the use of protective clothing or insect repellents and training in recognition and identification of harmful insects.

Poisonous Plants

Personnel need to be aware of poisonous plants in the environment. These plants include, but not limited to, poison ivy, poison oak, and poison sumac which are identified by three leaves or five leaves emanating from a stem. The plants contain a resin that causes a delayed reaction on contact. Signs and symptoms are usually evident within 24 to 48 hours after exposure. These include burning, stinging, and blisters. Notify the Site-specific health and safety officer if these plants are observed. If exposure or contact occurs, wash the affected area, but do not spread the resin to unexposed areas.

The following table presents generalized hazards potentially involved with the tasks to be completed on this project. Table 2 identifies general procedures to follow to prevent or reduce accident, injury or illness. Any worker on-site who identifies a potential hazard must report the condition to the SHSO or designee, and initiate control of the hazardous condition.

Table 2 Potential Hazards and Control	
Potential Hazard	Control
Vehicular Traffic	<ol style="list-style-type: none">1. Wear Hi-Vis safety vest when vehicular hazards exist.2. Use cones, flags, barricades, and caution tape to define work area.3. Use vehicle to block work area.4. Use vehicle caution lights in high traffic areas within the Site.5. Contact local police for high traffic situations on public roadways.
Slip, Trip, and Fall Protection	<ol style="list-style-type: none">1. Assess work area to determine if there is a potential for falling. Additional PPE can be utilized to reduce slip, trip, fall hazards.2. Make sure work area is neat and tools are staged in one general area.3. Wear steel-toe boots with adequate tread and always watch where the individual is walking. Carry flashlight when walking in poorly lighted areas.
Inclement Weather	<ol style="list-style-type: none">1. Stop outdoor work during electrical storms and other extreme weather conditions such as extreme heat or cold temperatures.2. If there is lightning or thunder, staff need to stop work for 30 minutes since last occurrence and take cover in a safe location. Not in a field or under a tree.3. Take cover indoors or in vehicle.4. Listen to local forecasts for warnings about specific weather hazards such as tornadoes, hurricanes, and flash floods.
Utility Lines Contact	<ol style="list-style-type: none">1. Contact UFPO to have utility lines marked prior to any underground excavation, trenching or drilling. UFPO must be contacted at least 72 hours prior to work.2. Conduct onsite utility mark out by a subcontractor, if needed.3. Refer to Site drawings for utility locations.4. Pre-clear the utility. Refer to the guidance on clearance from Dig Safely 411 or 811.
Noise	<ol style="list-style-type: none">1. Wear hearing protection when equipment such as a drill rig, excavator, jackhammer, or other heavy equipment is operating on-site.2. Wear hearing protection whenever you need to raise your voice above normal conversational speech due to a loud noise source as this much noise indicates the need for protection.

Table 2 Potential Hazards and Control	
Potential Hazard	Control
	3. Hearing protection is required when measured sound exceeds 85 decibels (dB) where employees stand or conduct work.
Electrical Shock	1. Maintain appropriate distance between heavy equipment and overhead utilities; 20-foot minimum clearance from power lines; and 10-foot minimum clearance from shielded power lines. 2. Contact local underground utility locating service prior to penetrating the ground surface.
Hand and Power Tools	1. Ensure cords to tools are not frayed and are properly grounded. 2. Ensure guards for power tools are in place (such as portable circular saw) as recommended by the manufacturer. 3. Tool cutting edges are kept in proper condition so the tool will operate properly. 4. Worn or bent tools are not to be used. Tool handles must be secure. 5. When not in use, tools are stored in a dry, secure location. 6. Ensure proper PPE use with hand and power tools. Cut or puncture resistant gloves, or work gloves to provide protection may be used. Check with OSHO or SSHO prior to use of the power tools. 7. If a generator is used with the power tools, ensure there is proper ventilation for the generator.
Physical Injury	1. Wear safety glasses, reflective Hi-vis safety vest and/or shirt always when on-site. Personnel to have hearing protection on them and in use when it is required. 2. Maintain visual contact with any equipment operators and wear hard hats and Hi-vis safety vest when heavy equipment is operating on-site. Be aware of other vehicle traffic while heavy machinery is operating on-site. 3. Avoid loose clothing, long hair, and jewelry when working around rotary equipment. 4. Keep hands and feet away from drilling augers, excavation equipment tracks/tires, and other on-site heavy equipment. 5. Test emergency shut-off switches on equipment prior to daily use. 6. Wear life preserver in boats.

Table 2 Potential Hazards and Control	
Potential Hazard	Control
	<ol style="list-style-type: none"> 7. Do not enter manholes or confined spaces. 8. Be aware of openings into manholes and keep area clear of trip hazards. 9. Be aware of outside terrain – steep slopes and slip, trip hazards while working. 10. Be aware of biological hazards on-site such as insects (bees, mosquitoes, and flies), ticks, spiders, and snakes. 11. Be aware of botanical hazards such as poison ivy, poison sumac, and giant hogweed.
Back Injury	<ol style="list-style-type: none"> 1. Use a mechanical lifting device or a lifting aid where appropriate. 2. Ensure the route is free of obstructions. 3. Bend at the knees and use leg muscles when lifting. 4. Use the buddy system if lifting heavy or awkward objects. 5. Do not twist or jerk your body when lifting.
Heat Stress	<ol style="list-style-type: none"> 1. Increase consumption of water and electrolytes while working. 2. Avoid excessive alcohol intake the night before working in heat stress situations. 3. Avoid excessive caffeine intake when working in heat stress situations. 4. Increase number of rest breaks as necessary, and rest in a shaded area. 5. Watch for signs and symptoms of heat exhaustion and fatigue. 6. Rest in cool, dry areas. 7. In the event of heat stress or heat stroke, bring the victim to a cool environment and call 911.
Cold Stress	<ol style="list-style-type: none"> 1. Wear cotton, wool or synthetic (polypropylene) undergarments to absorb perspiration from the body. 2. Wear additional layers of light clothing as needed for warmth. The layering effect holds in air, trapping body heat, and some layers could be removed as the temperature rises during the day. 3. Pay close attention to body signals and feelings (hypothermia symptoms), especially to the extremities. Correct any problem indicators by breaking from the work activity and moving to a rest area to warm up and add additional clothing.

Table 2 Potential Hazards and Control	
Potential Hazard	Control
	<ol style="list-style-type: none"> 4. Increase water intake while working. 5. Avoid excessive alcohol intake the night before working in cold conditions. 6. Increase the number of rest breaks as necessary, and rest in a warm area. 7. In the event of hypothermia or frost bite, bring the victim to a warm environment and call 911.
Fire Control	<ol style="list-style-type: none"> 1. Smoking is not allowed on-site. 2. Keep flammable liquids in closed containers. 3. Isolate flammable and combustible materials from ignition sources. 4. Keep fire extinguisher nearby and use only if deemed safe. 5. Inform SHSO prior to a chemical being brought on-site. 6. Facility Hot Work permit may be required for certain tasks. "Hot work" means riveting, welding, flame cutting or other fire or spark-producing operation.
Media Sampling (water, soil, sediment, soil gas, etc.)	<ol style="list-style-type: none"> 1. Wear appropriate PPE to avoid skin, eye, and inhalation contact with contaminated media. 2. Stand upwind to minimize possible inhalation exposure, especially when opening monitoring wells or closed containers/vessels. 3. Conduct air monitoring, whenever necessary, to determine level of respiratory protection. 4. If necessary, employ engineering controls to assist in controlling chemical vapors. 5. When collecting samples on or near water bodies, wear a life jacket and employ the buddy system. 6. When collecting samples from water bodies, assess water conditions and the water current and ensure that the sampling vessel is stabilized, or the water is safe to enter.
Cleaning Equipment	<ol style="list-style-type: none"> 1. Wear appropriate PPE to avoid skin and eye contact with Alconox or other cleaning materials. 2. Stand upwind to minimize possible inhalation exposure.

Table 2 Potential Hazards and Control	
Potential Hazard	Control
	3. Properly dispose of spent chemical cleaning solutions and rinse accordingly.
Deer Ticks	1. Wear long pants and long sleeve shirts. Pants could be tucked into the top of socks at boot level. Shirt tucked into pants. 2. Wear insect repellant clothing, if available, see SHSO for appropriate clothing. 3. Use tick repellent, this will need to be cleared with OSHO or SHSO to ensure that new chemicals are not introduced to the Site. 4. Perform personal body checks for the presence of ticks, after field work is complete and before the personnel have left the Site. 5. Notify the Office Health and Safety Officer immediately if you have been bitten by a tick or discovered a tick on yourself.
Excavations	1. Do not stand near the edge of an excavation, regardless of how deep or shallow the excavation might be. Maintain a distance of at least five (5) feet away from the excavation edge. 2. Do not enter any excavations, regardless of how deep or shallow the excavation might be. 3. Always remain in the view of the excavator operator. Do not stand behind the excavator.
Explosive Gas Monitoring	1. Be cautious when using equipment to drive the sampling point into the ground. 2. Wear gloves at all times when installing the sampling point. 3. Maintain sufficient air space between the end of the explosive gas sampling point to prevent incidental inhalation. 4. Employ the buddy system to alert others of your presence on-site.
Setting Survey Points	1. Wear appropriate PPE to avoid skin, eye, and inhalation contact with contaminated media. 2. Stand upwind to minimize possible inhalation exposure, especially when near monitoring wells, sludge and sewage areas, or closed containers/vessels.

Table 2	
Potential Hazards and Control	
Potential Hazard	Control
	3. Conduct air monitoring, whenever necessary to determine level of chemical vapors and determine respiratory protection. 4. If necessary, employ engineering controls to assist in controlling chemical vapors.
Note: A first aid kit and fire extinguisher will be located in the C.T. Male company vehicle.	

Response actions to personal exposure from on-site contaminants include skin contact, eye contact, inhalation, ingestion, and puncture or laceration. The recommended response actions are presented in Section 11.2.

5.9 Airborne Infectious Disease Plan and COVID-19

C.T. Male will follow applicable CDC, OSHA, New York State, and Local authorities for COVID-19 and other related infectious diseases. To address work Site safety regarding infectious disease exposure (including COVID-19), C.T. Male personnel will follow C.T. Male Associates 'Airborne Infectious Disease Exposure Prevention Plan' dated August 5, 2021. This plan would be followed when an airborne infectious disease is designated by the NYS Health Commissioner as a highly contagious communicable disease that presents a serious risk of harm to the public health.

For field activities, C.T. Male shall follow C.T. Male's SOP - 'Procedures for field staff in relation to COVID-19 or other virus', dated March 19, 2020, when applicable.

In addition to the above referenced Plan and SOP, C.T. Male employees will not report to work and notify their supervisor immediately if they are experiencing illness such as fever, cough, shortness of breath or difficulty breathing, chills, repeated shaking with chills, muscle aches, sore throat, loss of taste or smell, or runny/stuffy nose.

C.T. Male will also:

- Make effort to hold safety/tailgate meetings outdoors; maintain social distancing of six feet;
- Avoid sharing tools and equipment without cleaning and disinfecting;

- Avoid touching their eyes, nose and mouth with unwashed hands;
- Cover their cough or sneeze with a tissue, then throw the tissue in the trash;
- Clean and disinfect frequently touched objects and surfaces using a bleach solution or wipe; and,
- Wash their hands often with soap and water for 20 seconds, and use an alcohol-based hand sanitizer that is 60% alcohol when soap and water are unavailable.

6.0 TRAINING

Site specific training of workers and personnel will be conducted and provided by the SHSO or OHSO or designee prior to any on-site activity. The training will specifically address the activities, procedures, monitoring and equipment for the site operations. It will include area and facility layout (including a walkthrough of the site), hazards, emergency services (police, hospital, fire, etc.), and review of this HASP. Questions by workers, field personnel, etc. will be addressed at this time.

Workers and personnel conducting and/or supervising the project must have attended and successfully completed a 40 Hour Health and Safety Training Course for Hazardous Waste Operations, an annual 8 hour Refresher Course, a 10-hour Occupational Safety and Health Training Course in Construction Safety & Health, and take part in an employer medical surveillance program in accordance with OSHA 1910.120 requirements, specifically, that the workers have had a medical physical within one (1) year prior to the date the work begins and that they are physically able to wear a respirator, and have been fit tested.

Documentation of training and medical surveillance will be submitted to the OHSO or designee prior to the start of any on-site work. A copy of the training certificates shall be maintained by the OSHO and Human Resources Department at the C.T. Male Latham Office.

7.0 SITE ACCESS

The RA will be performed within the Site boundaries. Due to the Site location, it is possible that the public or curious bystanders will be present at the time of the work. Therefore, the exclusion/work zone will be considered any area of the Site where exposed waste exists. Only OSHA trained C.T Male staff which are qualified to do the work and have read and signed this Site specific HASP and have been briefed by the SHSO will be allowed within the exclusion/work zone. The exclusion/work zone will be secured, at a minimum, with construction fencing to prevent unauthorized entry. The SHSO or designee will be responsible for limiting access to unauthorized individuals employed by C.T. Male, visitors to the Site, and the general public. Other subcontractors and contractors will be responsible for limiting/granting access to their employees.

The Contamination Reduction Zone (decontamination area), and Support Zone (clean area) shall be established outside the work area as necessary. The work/exclusion, contamination reduction and support zone during the RA work have been identified and designated as follows:

Exclusion Zone - The location of the exclusion zone will be determined in the field prior to the start of work and will vary depending on the work activities conducted. For the most part, the exclusion zone is anticipated to be a 25-foot buffer around the edge of any waste disturbance. The outside exclusion zones may be delineated with cones and yellow caution tape or equal method, where applicable. Only authorized C.T. Male employees with proper training and protective gear will be allowed to enter the exclusion zone. If the exclusion zones, as previously explained, changes orientation during the completion of the work, the HASP will be amended in the field to reflect the change.

Contamination Reduction Zone - If applicable, this zone will generally be a 10'± by 10'± area, marked off with stakes and blue and white colored flagging or equal method, containing the decontamination pad. The location will be determined in the field prior to the start of work and will vary depending on the area(s) the work is being conducted. This zone is where decontamination of personnel and equipment will take place, as necessary, on the basis of the work being performed. It will be located upwind of the Exclusion Zone, if possible.

Support Zone - Area outside of contamination reduction zone and not including the exclusion zone. Unauthorized or untrained C.T. Male employees must remain in this zone.

8.0 PERSONAL PROTECTION

8.1 Level of Protection

Based on evaluation of the potential hazards, the minimum level of protection to be worn by workers during implementation of the RA activities is defined as Level D protection and will be determined by the SHSO or designee.

The minimum level D protective equipment will consist of field clothes, Hi-Vis vests, Hi-Vis shirts, rubber gloves (**NITRILE and/or PVC ONLY**), safety glasses, face covering (COVID-19) and safety boots (steel or composite toed). As appropriate, this level of protection may be modified to include hard hats, ear plugs, protective suits (**NOT TYVEK**), coveralls, leg chaps, or face shield for additional protection.

If required, level C protective equipment will consist of the items listed for Level D protection with the added protection of a half face air purifying respirator or a full-face air purifying respirator equipped with combination organic vapor and particulate cartridges as outlined in Section 5.5., chemical resistant clothing (**NOT TYVEK**), inner and outer chemically resistant gloves (i.e. nitrile and/or PVC), and chemical resistant safety over boots. Prior to field staff donning a respirator, C.T. Male PM and OSHO will need to approve the use of the respirator and staff donning them. Staff that have medical clearance and have been fit tested, should have their full-face or half-face air purifying respirators available. Appropriate combination organic vapor and particulate cartridge filters will be available at the Site to use, if necessary, with the air purifying respirators.

Level A or B is not anticipated, but if required, level B protective equipment will consist of the items listed for Level D protection except a self-contained breathing apparatus (SCBA) will be worn dependent on the level of contaminants present in the work zone, and protective suits (**NOT TYVEK**) will be required. When site conditions warrant the need for level A or B protective equipment, work will cease, and the project will be re-evaluated to determine the necessity for employing engineering controls to reduce or eliminate the potential contaminants of concern. C.T. Male staff are not approved for donning SCBA equipment.

8.2 Safety Equipment

Basic emergency and first aid equipment will be available at an area within the Support Zone clearly marked and available or within C.T. Male company vehicle. This shall include, at a minimum, a first aid kit, fire extinguisher, supply of potable water, hand sanitizer, soap, towels face coverings, Clorox wipes or bleach solution. Extra PPE will also be kept in the work area, or within C.T. Male company vehicle.

The construction manager/general contractor will be responsible for maintaining their own basic emergency and first aid equipment.

9.0 COMMUNICATIONS

9.1 General

The SHSO or designee shall be equipped with a mobile phone in case of emergencies. The SHSO or designee shall notify the C.T. Male project manager as soon as safely possible in the event of an accident, injury or emergency action. C.T. Male employee shall not be working in a work zone alone and may rely on the Contractor for emergency assistance if a mobile phone is not available or is inoperable.

Hand signals for certain work tasks will be employed, as necessary, and the buddy system will be employed during excavation, grading, construction, sampling, relocation of wastes and drum management activities.

Employing a buddy system will allow a person to travel to the construction trailer in the event of an emergency, exposure or injury.

9.2 Tailgate Safety Meetings

Prior to the daily start of work, a tailgate safety meeting shall be held between C.T. Male and any subcontractor. The content of the meeting shall be what work tasks are planned, what hazards may exist, what controls are being put in place and what emergency actions will be taken. Each person working on Site shall be familiar with the location of the hospital and reminded to call 911 in the case of an emergency.

10.0 DECONTAMINATION PROCEDURES

10.1 Personnel Decontamination Procedures

Decontamination procedures will be carried out by all personnel leaving the Exclusion Zone (except under emergency evacuation). The amount of decontamination performed will be dependent on the level of personal protection currently being worn within the exclusion zone.

1. Do not remove respiratory protection until all steps have been completed.
2. Clean outer protective gloves and outer boots, if worn, with water (preferably with a pressurized washer) over designated wash tubs in the exclusion zone to remove the gross amount of contamination.
3. Deposit equipment used (tools, sampling devices, and containers) at designated drop stations - on plastic drop sheets or in plastic lined containers.
4. Rinse outer boots if worn and gloves with clean water in designated rinse tubs. Remove outer boots if worn and gloves and deposit in designated area to be determined in the field for use the next day or when necessary. If disposable outer boots are worn, remove and discard in designated container.
5. Remove hard hat & safety glasses, rinse with clean water as necessary and deposit in designated area for use the next day or when necessary. Use of Clorox wipes (or similar, with EPA registered disinfectants for protection against SARS-CoV-2).
6. Remove Tyvek suit, if worn, and discard in designated container. Remove respirator at this time, if used; wash and rinse with clean water. Organic vapor cartridges, when used, will be replaced daily. Used cartridges will be discarded in the designated waste container. Remove inner gloves and discard in designated container.
7. Prior to entering the C.T. Vehicle, ensure that C.T. Male SOP for field staff in relation to COVID-19 is followed, if applicable.

10.2 Equipment and Sample Containers Decontamination

All decontamination will be completed by personnel in protective gear appropriate for the level of protection determined by the site SHSO or designee. Manual sampling equipment including scoops, hand augers, and shovels which come into contact with the Site's soils and sediment, will be cleaned with a tap water (or filtered water)/detergent wash and a tap water (or filtered water) rinse. The sampling equipment will be decontaminated after each sample is collected at the Contaminant Reduction Zone (Decontamination Station). The sampling equipment wash, and rinse water will be captured in plastic pails or tubs and ultimately transferred to labeled appropriate storage container(s) (e.g.: DOT 17H approved 55-gallon open top steel drum or frac tank) and staged on-Site at a secure location.

Drill rig equipment (i.e., casing, drill rods, bits, core samplers) which comes into contact with the Site's soils will be decontaminated with a high pressure/hot water wash and/or other methods within the Contaminant Reduction Area. The cleaning will be performed at the completion of each boring location. Equipment decontamination wastes will be transferred to labeled appropriate storage containers and staged on-Site at a secure location.

Larger equipment (i.e., drill rig, excavator) which comes into contact with the Site's soils will be decontaminated with a hot water wash and/or other methods within a decontamination pad. The decontamination procedure will focus on portions of the equipment that has come into contact with the Site's soils such as the tires, excavator bucket and tracks. The cleaning will be performed prior to the equipment leaving the Site. Equipment decontamination wastes will be transferred to labeled appropriate storage containers and staged on-Site at a secure location.

Exterior surfaces of sample containers will be wiped clean with disposable paper towels in the decontamination zone and transferred to a clean cooler for transportation or shipment to the analytical laboratory. Sample identities will be noted and checked off against the chain-of-custody record. The disposable paper towels will be placed in the designated disposal container and disposed of as solid waste.

11.0 EMERGENCY RESPONSE PROCEDURES

THE PROJECT EMERGENCY COORDINATOR IS:

Project Manager

Jim McIver
845.454.4400, ext. 111 (O)
845.594.1788 (C)

Office Health and Safety Officer (OHSO)

Nancy Garry
518.786.7541 (O)
518.320.5783 (C)

Site Health and Safety Officer (SHSO) To be determined, based on field staff onsite

The following standard emergency procedures will be used by on-site personnel. The Project Manager, OHSO, and SHSO shall be notified of any on-site emergencies and be responsible for assuring that the appropriate procedures are followed.

11.1 Personal Injury

Emergency first aid shall be administered on-site as deemed necessary and only by a trained individual, if available at the Site. If a trained individual is not available on-site, decontaminate, if feasible, and transport individual to nearest medical facility (St. Luke's Cornwall Hospital). A map depicting the route to St. Luke's Cornwall Hospital is shown as Figure 2. If feasible, the injured individual shall not transport themselves to the nearest medical facility. The SHSO will be responsible for completing the incident report in conjunction with the employee.

11.2 Personal Exposure

The recommended response to worker exposure from contaminants on-site includes the following:

SKIN CONTACT: Use generous amounts of soap and water. Wash/rinse affected area thoroughly, then provide appropriate medical attention, as necessary.

EYE CONTACT: Wash eyes thoroughly with potable water supply provided on site. Eyes should be rinsed for at least 15 minutes subsequent to

chemical contamination. Provide medical attention, as necessary.

INHALATION: Move worker to fresh air and outside of the work zone and/or, if necessary, decontaminate and transport to hospital (St. Luke's Cornwall). If respirator use is implemented at the time of inhalation, worker must not remove respirator until completely away from the work zone.

INGESTION: Decontaminate, if feasible, and transport to hospital (St. Luke's Cornwall).

PUNCTURE WOUND OR

LACERATION: Provide first aid at the site and if wound needs medical attention, decontaminate, if feasible, and transport to hospital (St. Luke's Cornwall).

If the affected worker is exposed to contaminants on-site and the injury or accident prevents decontamination of the individual, the emergency responders must be notified of this condition and the exposure must be kept to a minimum.

11.3 Potential or Actual Fire or Explosion

Immediately evacuate area in the event of potential or actual fire or explosion. Notify the local fire and police departments, and other appropriate emergency response groups, as listed in Section 1.2. Perform off-site decontamination and contain wastes for proper disposal. If a fire or explosion occurs, all on-site personnel must meet in the designated area of the Site (established by the SHSO or designee) for an accurate head count.

11.4 Equipment Failure

Should there be any equipment failure, breakdown, etc. the Project Manager and SHSO shall be contacted immediately. The Project Manager or the SHSO will make every effort to replace or repair the equipment in a timely manner.

11.5 Spill Response

The SHSO or designee shall initiate a corrective action program with the subcontractors in the event of an accidental release of a hazardous material or suspected hazardous material. The SHSO or designee will act as the Emergency Coordinator with the subcontractors for the purposes of: spill prevention; identifying releases; implementing clean up measures; and notification of appropriate personnel.

The corrective action program will be implemented by the SHSO and subcontractor to effectively control and minimize any impact accidental releases may have to the environment.

Effective control measures will include:

- Preliminary assessment of the release
- Control of the release source
- Containment of the released material
- Effective clean-up of the released material

Potential sources of accidental releases include: hydraulic oil spills or petroleum leaks from heavy equipment; and spills from unexpected encounter of drums, vats, vessels, and tanks. The SHSO/Emergency Coordinator in conjunction with the subcontractor shall respond to an accidental release in the following manner:

- Identify the character, source, amount and area affected by the release.
- Have subcontractor take all reasonable steps to control the release.
- Notify the NYSDEC Spill Hotline at 1-800-457-7362. Notify NYSDEC Project Manager Kiera Thompson and the City of Newburgh.
- Contain the release with sorbent material which should include speedi-dry, spill socks and sorbent pads.
- Prevent the release from entering sensitive receptors (i.e., catch basins and surface water) using the specified sorbent material or sandbags.
- Coordinate cleanup of the release material.
- Oversee proper handling and storage of contaminated material for disposal.

At no time should personal health or safety be compromised or jeopardized in an attempt to control a release. All health and safety measures as outlined in this HASP should be adhered to.

12.0 ADDITIONAL WORK PRACTICES

Workers will be expected to adhere to the established safety practices. Work on the project will be conducted according to established protocol and guidelines for the safety and health of all involved. The following will be adhered to:

- Employ the buddy system when possible, and for those work tasks which require it. The buddy system may be applied by utilizing contractor staff. Establish and maintain communications.
- Minimize contact with potentially contaminated soil and water.
- Employ disposable items when possible to minimize risks during decontamination and possible cross-contamination during sample handling.
- Smoking, eating, or drinking after entering the work zone and before decontamination will not be allowed (to prevent oral ingestion of potential on-site contaminants).
- Avoid heat and other work stress related to wearing personal protective equipment. Take breaks as necessary and drink plenty of fluids to prevent dehydration.
- Withdrawal from a suspected or actual hazardous situation to reassess procedures is the preferred course of action.
- The removal of facial hair (except mustaches) prior to working on-site will be required to allow for a proper respiratory face piece fit.
- The Project Manager, the OHSO, the SHSO and sampling personnel shall maintain records recording daily activities, meetings, facts, incidents, data, etc. relating to the project. These records will remain at the project Site during the full duration of the project so that replacement personnel may add information while maintaining continuity.

13.0 AUTHORIZATIONS

Personnel authorized to enter the exclusion zone at the Brownfield Cleanup Program located at the 5 Scobie Drive Site in the City of Newburgh, Orange County, New York while operations are being conducted must be certified by the OHSO or SHSO. Authorization will involve completion of appropriate training courses, initial jobsite briefing including a walkthrough of the project site, and review and sign off this HASP prior to entry.

Personnel authorized to perform work on-site are as follows:

1. <u>James D. McIver</u>	<u>C.T. Male Associates</u>
2. <u>Kristine Garbarino</u>	<u>C.T. Male Associates</u>
3. <u>Jeffrey Marx</u>	<u>C.T. Male Associates</u>
4. <u>Dan Achtyl</u>	<u>C.T. Male Associates</u>
5. <u>Jon Dippert</u>	<u>C.T. Male Associates</u>
6. <u>Aimee Smith</u>	<u>C.T. Male Associates</u>
7. <u>Rosaura Andújar-McNeil</u>	<u>C.T. Male Associates</u>
8. <u>Brittany Taranto</u>	<u>C.T. Male Associates</u>
9. <u>Mary Loughlin</u>	<u>C.T. Male Associates</u>
10. <u>Chris Ormsby</u>	<u>C.T. Male Associates</u>
11. <u>Ryan Hubbard</u>	<u>C.T. Male Associates</u>
12. <u>Nancy Garry</u>	<u>C.T. Male Associates</u>
13. <u>Cliff Bondi</u>	<u>C.T. Male Associates</u>
14. <u>Dan King</u>	<u>C.T. Male Associates</u>
15. <u>Alex Malamet</u>	<u>C.T. Male Associates</u>
16. _____	<u>C.T. Male Associates</u>

14.0 FIELD TEAM REVIEW

Each field team member shall sign this section after site specific training is completed and before being permitted to work on-site.

I have read and understood this Site Specific Health and Safety Plan, and I will comply with the provisions contained therein.

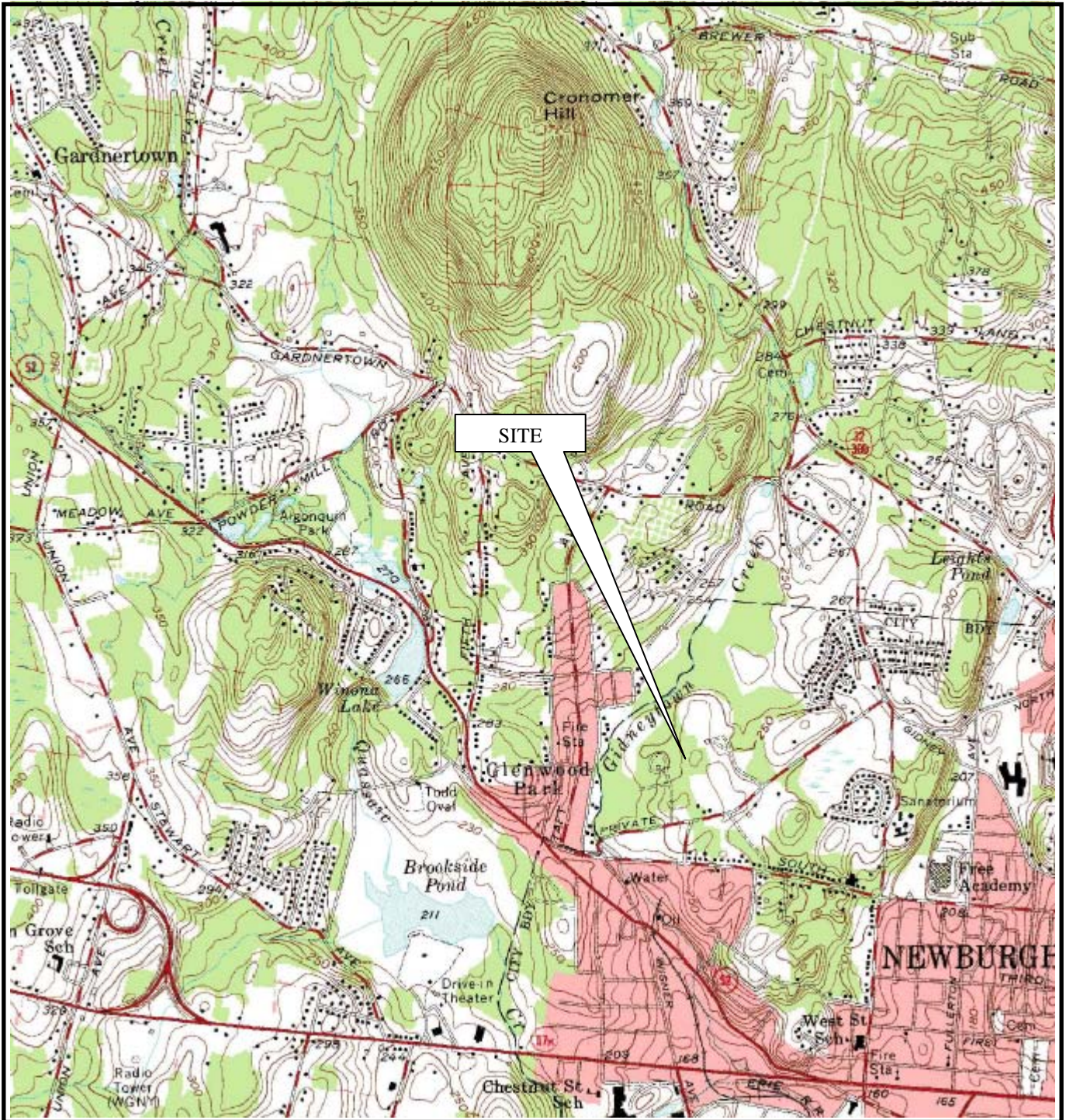
PROJECT: Remedial Action
5 Scobie Drive Site
City of Newburgh
Orange County, New York

Name: Printed

Signature

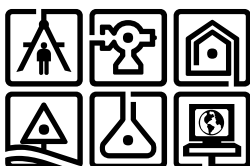
Date

FIGURE 1
SITE LOCATION MAP



MAP REFERENCE

United States Geological Survey
7.5 Minute Series Topographic Map
Quadrangle: Newburgh, NY
Date: 1957



C.T. MALE ASSOCIATES

ENGINEERING, SURVEYING, ARCHITECTURE & LANDSCAPE ARCHITECTURE, P.C.

50 CENTURY HILL DRIVE
LATHAM, NY 12110

FIGURE 1 - SITE LOCATION MAP

CITY OF NEWBURGH

ORANGE COUNTY, NY

SCALE: 1:2,000±

DRAFTER: ASG

PROJECT No: 13.3061

The locations and features depicted on this map are approximate and do not represent an actual survey.

FIGURE 2

**MAP SHOWING ROUTE TO
ST. LUKE'S CORNWALL HOSPITAL**

APPENDIX D

REQUEST TO IMPORT/REUSE FILL OR SOIL FORM



**NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION**



Request to Import/Reuse Fill or Soil

This form is based on the information required by DER-10, Section 5.4(e). Use of this form is not a substitute for reading the applicable Technical Guidance document.

SECTION 1 – SITE BACKGROUND

The allowable site use is:

Have Ecological Resources been identified?

Is this soil originating from the site?

How many cubic yards of soil will be imported/reused?

If greater than 1000 cubic yards will be imported, enter volume to be imported:

SECTION 2 – MATERIAL OTHER THAN SOIL

Is the material to be imported gravel, rock or stone?

Does it contain less than 10%, by weight, material that would pass a size 10 sieve?

Does it contain less than 10%, by weight, material that would pass a size 100 sieve?

Is this virgin material from a permitted mine or quarry?

Is this material recycled concrete or brick from a DEC registered processing facility?

SECTION 3 - SAMPLING

Provide a brief description of the number and type of samples collected in the space below:

Example Text: 5 discrete samples were collected and analyzed for VOCs. 2 composite samples were collected and analyzed for SVOCs, Inorganics & PCBs/Pesticides.

If the material meets requirements of DER-10 section 5.4(e)5 (other material), no chemical testing needed.

SECTION 3 CONT'D - SAMPLING

Provide a brief written summary of the sampling results or attach evaluation tables (compare to DER-10, Appendix 5):

Example Text: Arsenic was detected up to 17 ppm in 1 (of 5) samples; the allowable level is 16 ppm.

If Ecological Resources have been identified use the "If Ecological Resources are Present" column in Appendix 5.

SECTION 4 – SOURCE OF FILL

Name of person providing fill and relationship to the source:

Location where fill was obtained:

Identification of any state or local approvals as a fill source:

If no approvals are available, provide a brief history of the use of the property that is the fill source:

Provide a list of supporting documentation included with this request:

The information provided on this form is accurate and complete.

Signature

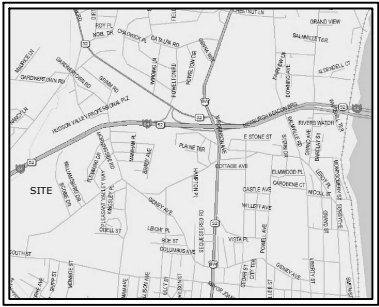
Date

Print Name

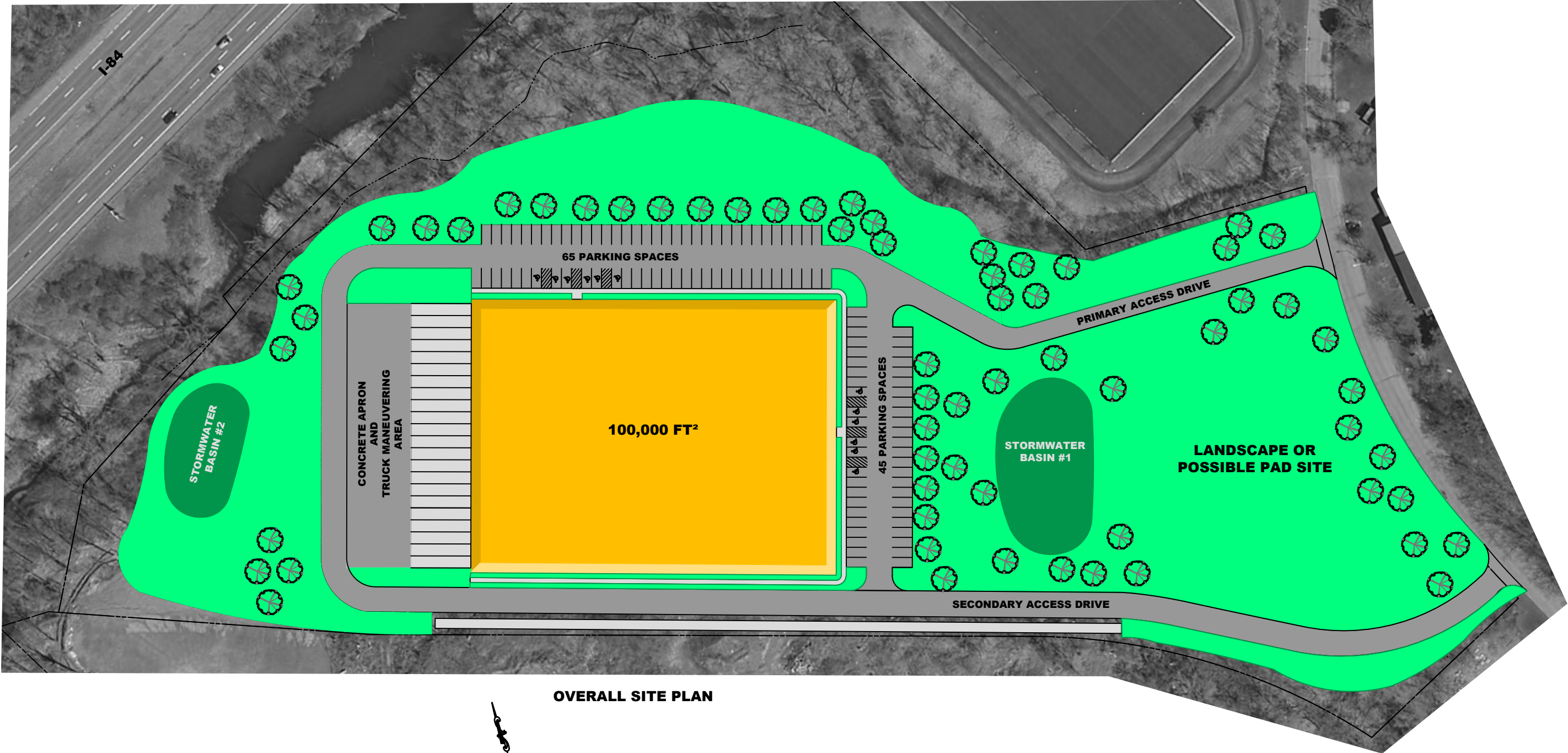
Firm

EXHIBITS

EXHIBIT 1
DRAFT CONCEPTUAL SITE PLAN



SITE LOCATION MAP
(NOT TO SCALE)



OVERALL SITE PLAN

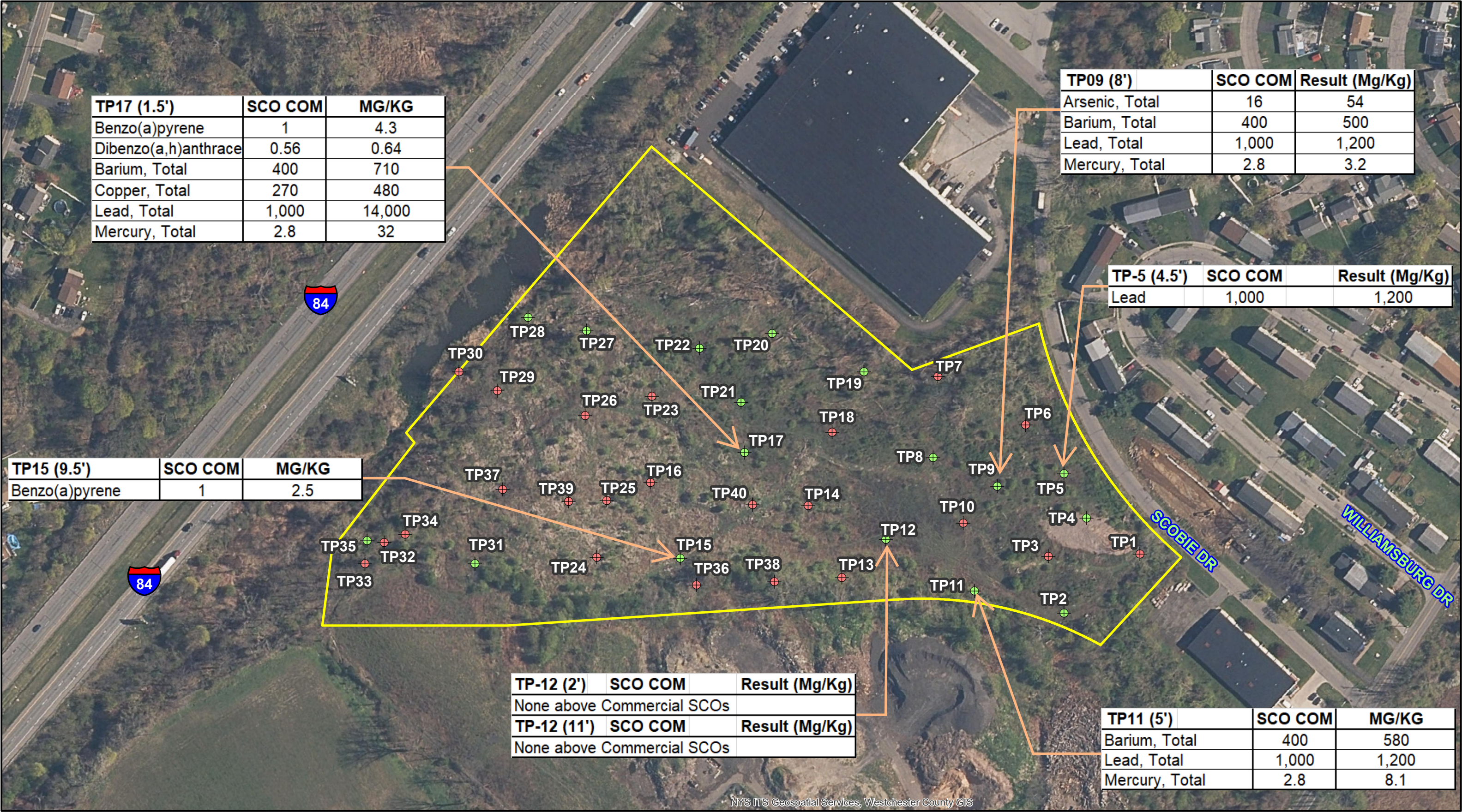


C.T. MALE ASSOCIATES Engineering, Surveying, Architecture, Landscape Architecture & Geology, D.P.C. 50 CENTURY HILL DRIVE, LATHAM, NY 518.786.7400 COBLESKILL, NY • GLENS FALLS, NY • POUGHKEEPSIE, NY JOHNSTOWN, NY • RED HOOK, NY • SYRACUSE, NY www.ctmale.com				OVERALL SITE PLAN			
PROJ. NO.: PROJ_NO				5 SCOBIE DRIVE BCP REDEVELOPMENT PROJECT			
DRAFTED: DRAFTED				MUNICIPALITY			
SCALE: SCALE				COUNTY/STATE			
DATE: DATE							

EXHIBIT 2

**FIGURE 6 – Surface Soil Parameters Above
Commercial Use SCOs**

**FIGURE 8 – Subsurface Soil Parameters Above
Commercial Use SCOs**



TP17 (1.5')	SCO COM	MG/KG
Benzo(a)pyrene	1	4.3
Dibenzo(a,h)anthrace	0.56	0.64
Barium, Total	400	710
Copper, Total	270	480
Lead, Total	1,000	14,000
Mercury, Total	2.8	32

TP09 (8')	SCO COM	Result (Mg/Kg)
Arsenic, Total	16	54
Barium, Total	400	500
Lead, Total	1,000	1,200
Mercury, Total	2.8	3.2

TP-5 (4.5')	SCO COM	Result (Mg/Kg)
Lead	1,000	1,200

TP15 (9.5')	SCO COM	MG/KG
Benzo(a)pyrene	1	2.5

TP-12 (2')	SCO COM	Result (Mg/Kg)
None above Commercial SCOs		
TP-12 (11')	SCO COM	Result (Mg/Kg)
None above Commercial SCOs		

TP11 (5')	SCO COM	MG/KG
Barium, Total	400	580
Lead, Total	1,000	1,200
Mercury, Total	2.8	8.1

0 150 300 450
1 inch = 150 feet

Legend
TP25 (red dot) Approximate Test Pit Location and Number - Sample Not Submitted For Laboratory Analysis
TP12(11) (green dot) Approximate Test Pit Location and Number - Sample Submitted For Laboratory Analysis with Depth at Which Sample was Collected
Yellow line Property Boundary (Approx)

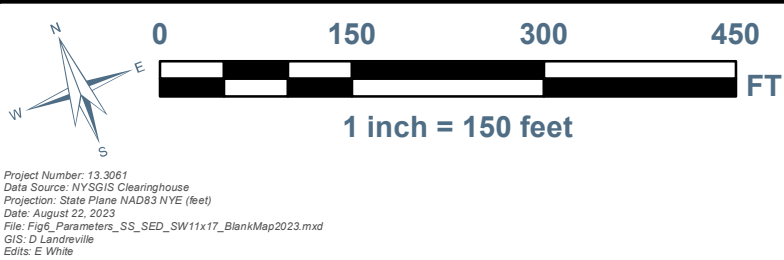
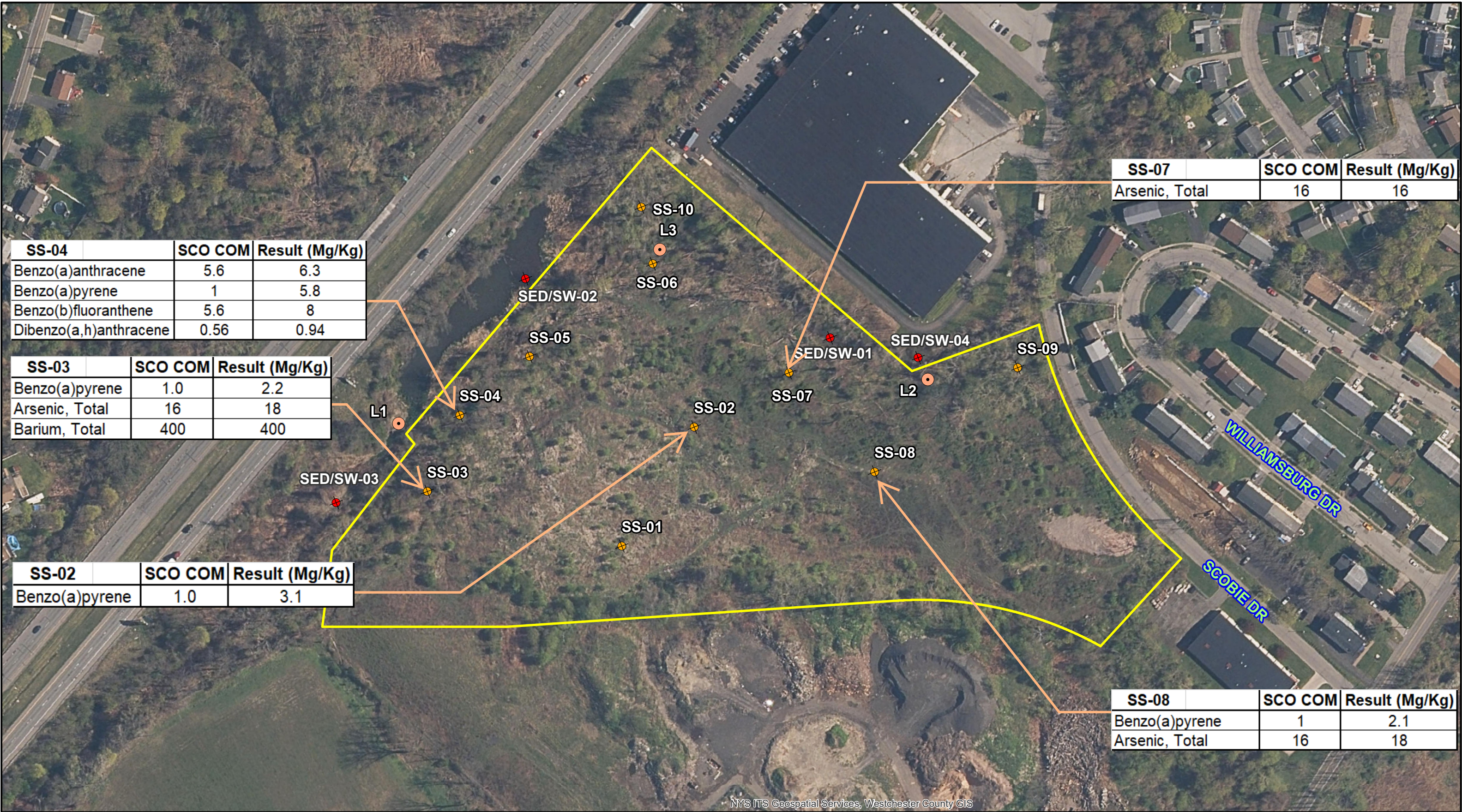
NOTES:
SCO COM: Soil Cleanup Objective Commercial Use
MG/KG: Milligrams per Kilogram or Parts per Million

Figure 8 - Subsurface Soil Parameters Above Commercial Use SCOs
5 Scobie Drive Site

City of Newburgh Orange County, New York

C.T. MALE ASSOCIATES
ENGINEERING, SURVEYING, ARCHITECTURE & LANDSCAPE ARCHITECTURE, D.P.C.
50 CENTURY HILL DRIVE, LATHAM, NEW YORK 12110
(518) 786-7400 * FAX (518) 786-7299 * WWW.CTMALE.COM
FOUNDED IN 1910

Project Number: 13.3061
Data Source: NYSGIS Clearinghouse, BING
Projection: State Plane NAD83 NYE (feet)
Date: August 22, 2023
File: Fig8_Parameters_SubsurfaceSoil11x17_BlankMap2023.mxd
GIS: D Landreville
Edits: E White



Legend

- Approximate Leachate Seeps Location and Number
- Approximate Sediment and Surface Water Sampling Location and Number (collected 5/19/14 & 5/20/14)
- Approximate Surface Soil Sampling Location and Number (collected 5/19/14 & 5/20/14)
- Property Boundary (Approx)

NOTES:
SCO ER: Soil Cleanup Objective Ecological Resources
SCO COM: Soil Cleanup Objective Commercial Use
NY-AWQS: TOGS 1.1.1 Ambient Water Quality Standard
MG/KG: Milligrams per Kilogram or Parts per Million
UG/L: Micrograms per Liter or Parts per Billion

Figure 6 - Surface Soil Parameters Above Commercial Use SCOs

5 Scobie Drive Site

City of Newburgh Orange County, New York

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EXHIBIT 3
JURISDICTIONAL DETERMINATION
FROM USACOE



DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
JACOB K. JAVITS FEDERAL BUILDING
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278-0090

OCT 14 2014

Regulatory Branch

SUBJECT: Permit Application Number NAN-2014-00798-WOR
by City of Newburgh Industrial Development Agency

John S. Munsey
C.T. Male Associates D.P.C.
50 Century Hill Drive
Latham, New York 12110

Dear Mr. Munsey:

On June 12, 2014, the New York District of the U.S. Army Corps of Engineers received a request for a Department of the Army jurisdictional determination for the above referenced project. The site consists of approximately 15.5 acres, located at 5 Scobie Drive in the City of Middletown, Orange County, New York. The proposed project would involve the construction of an industrial development.

In the letter received on June 12, 2014, your office submitted a proposed delineation of the extent of waters of the United States within the subject property. A site inspection was conducted by a representative of this office on August 20, 2014, in which it was agreed that changes would be made to the delineation and that the modified delineation would be submitted to this office. On October 8, 2014, this office received the modified delineation.

Based on the material submitted and the observations of the representative of this office during the site visit, this site has been determined to contain jurisdictional waters of the United States based on: the presence of wetlands determined by the occurrence of hydrophytic vegetation, hydric soils and wetland hydrology according to criteria established in the 1987 "Corps of Engineers Wetlands Delineation Manual," Technical Report Y-87-1 that are either adjacent to or part of a tributary system; the presence of a defined water body (e.g. stream channel, lake, pond, river, etc.) which is part of a tributary system; and the fact that the location includes property below the ordinary high water mark, high tide line or mean high water mark of a water body as determined by known gage data or by the presence of physical markings including, but not limited to, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter or debris or other characteristics of the surrounding area.

These jurisdictional waters of the United States are shown on the drawing entitled "Boundary & Topographic Survey Lands Now or Formerly of the City of Newburgh Industrial Development Agency 5 Scobie Drive City of Newburgh Orange County, New York", prepared by C.T. Male Associates, dated May 21, 2014, and last revised October 8, 2014. This drawing indicates that there is one (1) continuous principal wetland area on the project site which is part of a tributary system, and is considered to be waters of the United States. The wetland (Wetlands 1 and 1A) is located on the northwestern and northeastern portions of the property and is approximately 0.43 acres within the subject property.

This determination regarding the delineation shall be considered valid for a period of five years from the date of this letter unless new information warrants revision of the determination before the expiration date.

This determination was documented using the Approved Jurisdictional Determination Form, promulgated by the Corps of Engineers in June 2007. A copy of that document is enclosed with this letter, and will be posted on the New York District website at:
<http://www.nan.usace.army.mil/Missions/Regulatory/JurisdictionalDeterminations/RecentJurisdictionalDeterminations.aspx>

This delineation/determination has been conducted to identify the limits of the Corps Clean Water Act jurisdiction for the particular site identified in this request. If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed is a combined Notification of Appeal Process (NAP) and Request For Appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the North Atlantic Division Office at the following address:

James W. Haggerty, Regulatory Program Manager, CENAD-PD-OR
North Atlantic Division, U.S. Army Engineer Division
Fort Hamilton Military Community
General Lee Avenue, Building 301
Brooklyn, New York 11252-6700

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR Part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by DEC 15 2014. It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this letter.

This delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985, as amended. If you or your tenant are USDA program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service prior to starting work.

It is strongly recommended that the development of the site be carried out in such a manner as to avoid as much as possible the discharge of dredged or fill material into the delineated waters of the United States. If the activities proposed for the site involve such discharges, authorization from this office may be necessary prior to the initiation of the proposed work. The extent of such discharge of fill will determine the level of authorization that would be required.

In order for us to better serve you, please complete our Customer Service Survey located at <http://www.nan.usace.army.mil/Missions/Regulatory/CustomerSurvey.aspx>.

If any questions should arise concerning this matter, please contact Brian A. Orzel, of my staff, at (917) 790-8413.

Sincerely,

A handwritten signature in black ink, reading "Christopher S. Mallery". The signature is fluid and cursive, with a large, stylized "M" and "L".

Christopher S. Mallery, Ph.D.
Chief, Western Section

Enclosures

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: City of Newburgh Industrial Development Agency	File Number: NAN-2014-00798-WOR	Date: OCT 14 2014
Attached is:		See Section Below
<input type="checkbox"/>	INITIAL PROFFERED PERMIT (Standard Permit or Letter of Permission)	A
<input type="checkbox"/>	PROFFERED PERMIT (Standard Permit or Letter of Permission)	B
<input type="checkbox"/>	PERMIT DENIAL	C
<input checked="" type="checkbox"/>	APPROVED JURISDICTIONAL DETERMINATION	D
<input type="checkbox"/>	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/CECW/Pages/reg_permit.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the New York District Engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations (JD) associated with the permit.
- **OBJECT:** If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the New York District Engineer. Your objections must be received by the New York District Engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the New York District Engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the New York District Engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit.

- **ACCEPT:** If you received a Standard Permit, you may sign the permit document and return it to the New York District Engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- **APPEAL:** If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the North Atlantic Division Engineer, ATTN: CENAD-PD-PSD-O, Fort Hamilton Military Community, Building 301, General Lee Avenue, Brooklyn, NY 11252-6700. This form must be received by the Division Engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the North Atlantic Division Engineer, ATTN: CENAD-PD-PSD-O, Fort Hamilton Military Community, Building 301, General Lee Avenue, Brooklyn, NY 11252-6700. This form must be received by the Division Engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- **ACCEPT:** You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- **APPEAL:** If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the North Atlantic Division Engineer within 60 days of the date of this notice with a copy furnished to the New York District Engineer.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps

district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact:

Jodi M. McDonald
U.S. Army Corps of Engineers, New York District
Jacob K. Javits Federal Building
New York, NY 10278-0090
(917) 790-8720

If you only have questions regarding the appeal process you may also contact:

James W. Haggerty, Regulatory Program Manager, CENAD-PD-OR
North Atlantic Division, U.S. Army Engineer Division
Fort Hamilton Military Community
General Lee Avenue, Building 301
Brooklyn, NY 11252-6700
(347) 370-4650
E-mail: James.W.Haggerty@usace.army.mil

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

Signature of appellant or agent.

Date:

Telephone number:

